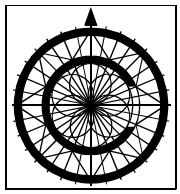

CHEMONICS INTERNATIONAL INC.

PROGRAMMATIC ENVIRONMENTAL ASSESSMENT CONCADE

Tourism and Eco-Tourism Facilities and Activities in
the Tropics of Cochabamba, Bolivia

Contract No.: LAG-I-00-99-00014-00
Task Order #823

Submitted to:
USAID/Bolivia

Submitted by:
Chemonics International Inc. • PA Consulting Group

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ACRONYMS

AD	Alternative Development
ASL	Asociaciones Sociales Locales
BEO	Bureau Environmental Officer
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CONCADE	Counter Narcotics Consolidation of Alternative Development Efforts
C-23	Proyecto de Apoyo al Manejo, Conservación y Explotación de los Recursos Forestales en Trópico de Cochabamba, Jatún Sacha, FAO-C-23
CHF	CHF International
CPA	CONCADE Program Area
CPTS	Center for the Promotion of Sustainable Technologies
CTR	Chapare Tropical Resort
DAA	Declaration of Environmental Adequacy
DAI	Development Alternatives, Inc.
DEA	Declaration of Environmental Impact
DRN	Dirección de Recursos Naturales y de Medio Ambiente
EA	Environmental Assessment
EIS	Environmental Impact Statement
EM	Environmental Manifest
EO	Executive Order
FAO	Food and Agriculture Organization of the United Nations
FDC	Farmer Development Fund
FIS	Social Investment Fund
FNDA	National Alternative Development Fund
FNDR	National Regional Development Fund
GOB	Government of Bolivia
IEE	Initial Environmental Evaluation
ILO	International Labour Organization
INRA	Instituto Nacional de Reforma Agraria
LAC	Latin America & the Caribbean
MEO	USAID Mission Environmental Office
NEPA	National Environmental Policy Act
NGO	Non-Governmental Organization
PEA	Programmatic Environmental Assessment
PRAEDAC	Programa de Apoyo a la Estratégia de Desarrollo Alternativo en el Chapare
REA	USAID Regional Environmental Advisor
SEA	Supplemental Environmental Assessment
SERNAP	Servicio Nacional de Áreas Protegidas
TCO	Territorios Comunitarios de Origen
USAID	United States Agency for International Development
USC	United States Code

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EXECUTIVE SUMMARY

In 1998 the United States Agency for International Development (USAID) designed and funded the expanded alternative development program – Counter Narcotics Consolidation of Alternative Development Efforts) or CONCADE. CONCADE provides licit economic opportunities to coca leaf producers in the Tropics of Cochabamba, commonly known as the Chapare. The Chapare has traditionally been the region where most of Bolivia's illegal coca has been produced (Map 1.1). Through CONCADE, USAID, the Government of Bolivia (GOB), and other governmental and non-governmental organizations, have been implementing a wide range of alternative development (AD) programs, varying from export-oriented agriculture to improving transportation infrastructure.

Tourism has been identified as an attractive area for potential investment under the CONCADE program. To assure compliance with agency environmental requirements and strengthen competitiveness of the tourism sector, this programmatic environmental assessment (PEA) was developed to evaluate environmental consequences associated with potential USAID investments in the Chapare tourism sector as a supplement to the original environmental assessment (1998) and subsequent supplemental environmental assessment (2001) previously prepared for CONCADE. This present PEA focuses on tourism activities within the CONCADE Program Area (CPA). It does not seek to repeat the findings of other CONCADE environmental assessments except where their findings are directly related to the tourism sector and related activities.

The PEA Team applied methodologies that included public participation through interviews with a wide range of individuals involved in the development of the region (see contact list Annex 6). Extensive sites visits were also carried out. As part of the scope of work for the PEA, guidelines for development of the tourism sector were prepared that draw on the extensive experience of USAID and PEA Team members in other parts of the Latin American region and are included in the present report (see Annex 5).

Proposed Action

USAID intends to pursue investment in the tourism sector as a component of the Chapare alternative development strategy. Funds will be allocated and dispersed to applicants for investment in existing infrastructure and to assist with the development of tourism itineraries and attractions. Funds will be managed as part of the international CHF grant program and will take the form of small grants (maximum amounts to be determined) to private operators, community-based initiatives, and government and non-government organizations for the development of regional attractions. Prospective recipients include two native tribes, the Yuracaré and the Yuqui, who occupy important indigenous reserves in the north of the CPA.

The addition of tourism activities to the CONCADE program is in response to discussions with regional investors and in recognition of the region's historically important role as a regional recreational and tourism destination. The majority of CONCADE activities have been based on consumptive uses of regional natural resources (agriculture, agroforestry, forest management, infrastructure), the existence of large protected areas (national parks), the region's location at the foothills of the eastern Andes, and a relatively well-developed infrastructure. These activities

provide a significant opportunity for tourism development, particularly nature-based tourism, with the potential to generate regional employment with relatively small, dedicated land requirements. Pressure on adjacent parklands is severe, with colonists increasingly moving into poorly protected parks in search of land. There is a need in the CPA to promote economic alternatives that will relieve the pressure associated with the demand for the large areas of land required for agricultural activities. Tourism is such an alternative to land-intensive activities and that can offset pressures on adjacent protected lands.

Preferred Alternative

The PEA examined five alternatives, including the No-action Alternative presented in following table. The Preferred Alternative is Alternative 3:

"Small- to medium-scale tourism infrastructure support and development."

This alternative is preferred given current excess hotel room capacity in the region and the tenuous nature of the region's tourism sector due to continuing social conflicts. At this time, investments should prioritize the upgrading of existing hotel infrastructure and the development of itineraries and attractions: nature centers, interpretive trails, and other facilities.

Under Alternative 3, no new lodging space will be built with the support of USAID funds, relegating the future development of lodging facilities to market forces. As the region matures and demand increases, entrepreneurs should respond with additional private investment. Rather, USAID support would focus on enhancing the tourism experience by improving facilities presently offered by small- and medium-scale operators and developing high-quality nature-based destinations to broaden the variety of potential experiences offered to visitors. This alternative is consistent with mitigating and monitoring potential impacts in the context of the CONCADE program.

Consequences of the Preferred Alternative

Tourism in the Chapare is, and will continue to be for the foreseeable future, a relatively benign activity in terms of negative environmental consequences. No significant negative environmental impacts were identified in association with the Preferred Alternative, which could not be mitigated within the scope of the proposed program. The major consequences of the Preferred Alternative are indirect, related to the inducement of tourism in the region. As the construction of no new commercial infrastructure is contemplated, impacts from siting and construction are minimized. Development of itineraries will occur in and around protected areas and/or indigenous reserves and must be planned and implemented with extreme caution. Trails developed within these areas would provide recreational opportunity, but could also induce new colonization. Tourists could locally compete with communities for food and water but this could be offset by the economic benefits generated. Investments in upgrading existing facilities and encouragement of an environmental management system approach for the operation of facilities would lessen local environmental problems from inadequate disposal of waste, solid wastes and the like.

The Preferred Alternative and associated mitigation measures (see below) will not result in:

- Loss of cultural or historic sites
- Introduction of plants or wildlife
- Relocation of affected persons
- Destructive or consumptive use of protected lands or habitats
- Destruction or displacement of endangered species or critical habitat

More significant are the effects of other regional activities on the tourism sector. As this activity will be part of the CONCADE development mix, the impact of other activities promoted by CONCADE (and other projects) must be considered as they affect the tourism potential for the region.

Environmental Management and Mitigation of Potential Impacts

Environmental mitigation measures are summarized in the table and focus on grant preparation, review and monitoring processes, training in environmental management and complimentary measures.

Table I. Summary of Proposed Mitigation Measures

Mitigation Measure	Responsible party	Estimated cost
Grant preparation, review and approval procedures		
MM1: The grant program for tourism will be guided by a clear strategy and vision.	CFH with USAID AD SOT	Strategy preparation: $5,000
MM 2: TOR for grant proposals will include: clear definition of the scope of eligible activities under the Preferred Alternative; an environmental checklist for the proposed activity drawn from the Guidelines for tourism development; requirements for compliance with Bolivian environmental law; specific guidance in the case of activities near or in protected areas and TCOs.	CFH with C-23 and USAID-REA assistance	Negligible: part of routine grant management operations
MM 3: Grant proposals will clearly demonstrate compliance with Bolivian environmental law and adequate information based on completion of the above environmental checklist. In the case of protected areas and TCO, grantees and implementing parties must obtain formal approval by the appropriate level of authority responsible for management of these lands as part of their grant application (SERNAP, CPITCO)	Grantees and implementing parties with assistance from CHF, as needed	Dependent on scale of proposed activity, but should be minimal for the scale of most projects eligible under the Preferred Alternative: < $500
MM 4: Environmental criteria, social impacts, and equity issues will be incorporated into and given equal weight in the overall grant evaluation process. All proposals must fall within the scope of tourism development activities approved under the Preferred Alternative, demonstrate how environmental impacts will be mitigated, and assure that adequate resources are allocated to do so. Uncertain cases will be deferred to Project C-23 and the USAID REA for review to determine the need for additional information and/or preparation of a separate IEE or EA, as appropriate under USAID environmental regulations.	CHF with assistance from Project C-23 and the USAID Regional Environmental Advisor (REA)	Negligible; part of routine operations
MM 5: Approved grant agreements will include specific environmental measures and conditions, as needed, based the attached Guidelines. Environmental criteria will be made part of overall project monitoring and reporting.	CHF and grantees	Negligible; part of routine operations
MM 6: Where feasible and appropriate, priority should be given to investments that foster community involvement and generate clear and significant benefits for community members, especially in TCOs and other economically isolated and marginalized communities.	CHF	Negligible; part of routine operations
MM 7: Through grants to individual operators and associations, special attention will be made to identify ways for promoting greater awareness of tourism opportunities in the region.	Grantees and implementing parities; CHF	Negligible; part of routine operations
Reporting and Monitoring		
MM 8: Progress in implementing agreed measures and conditions or how unanticipated impacts are being mitigated will be an integral part of routine project reporting by the grantee or implementing party.	CHF, grantees or other implementing parties	Negligible; part of routine grant implementation
MM 9: Corrective actions, as needed, will be taken in a timely matter by the grantee or implementing party as a condition for continued support under the grant.	Grantees or other implementing parties; CHF	Variable; project-specific
MM 10: Environmental criteria as outlined in the Guidelines and grant agreements will be applied during routine site visits.	CHF	Negligible; part of routine operations

Mitigation Measure	Responsible party	Estimated cost
MM 11: As part of its environmental oversight responsibilities in the CONCADE project, the Environmental Unit of C-23 project will carry out periodic site visits of approved grants and collaborate with CHF in working with grantees and implementing parties to assure that corrective actions are taken.	Project C-23	National consultant; 8 person-weeks per year plus mobilization; approximately $16,000 over 2 years.
MM 12: A brief report on compliance with mitigation measures under the present PEA will be included in quarterly progress reports and an annual report to the Alternative Development SOT. The annual report shall be prepared at the end of the calendar year for approval by the MEO.	CHF and Project C-23	Negligible; part of routine operations
MM 13: The Environmental Guidelines that are annexed to this PEA will be edited, translated and distributed to municipal authorities, tourism operators, TCO authorities, prospective grantees and other interested parties. Workshops will be held to present and discuss the Guidelines.	CHF with collaboration with Project C-23	200 copies in Spanish; 10 half-day workshops: $25,000
Training		
MM 14: Continuous training will be provided to CHF personnel responsible for grant management in: • USAID environmental procedures (22 CFR 216) and Bolivian environmental law (Law 1333) • Principal environmental concerns associated with proposed investments under the grant program generally and tourism specifically. • Specific procedures and measures approved under the EAs, SEA and PEAs approved for CONCADE. • Environmental Management System approaches to continuously improve the competitiveness and environmental quality of grantee operations.	Project C-23 in coordination with CTPS, Dirección de Recursos Naturales, others as appropriate	20-30 hours/person annually; $20,000 over 2 years.
MM 15: Training will be provided to grantees and implementing parties in: • Compliance with approved environmental measures and conditions under grant agreements (mandatory). • Introduction to Environmental Management System (EMS) approaches to continuously improve the competitiveness and environmental quality of grantee operations (mandatory)*. • Preparation of Environmental Management Plan for their operations (optional; according to demand and interest). ***** A simple EMS can be a first step toward internationally recognized environmental certification (ISO 14000, Green Globe 21, etc.). As the business environment for tourism evolves in the Chapare, a fuller program toward certification of tourism operators could be considered.	CHF and Project C-23 in coordination with Center for the Promotion of Sustainable Technologies Program (CPTS), Chamber of Hotel Operators, Dirección de Recursos Naturales, others as appropriate	Minimum 4 hours training for each grantee before award of grant; additional optional training 8 – 16 hours/grantees for preparation of Environmental Management Plan; $30,000 over 2 years.
Complementary Measures		
MM 16: Municipalities in the CONCADE project area will be provided assistance in developing zoning and construction standards for related-tourism infrastructure to better assure the safety of visitors, avoid environmental impacts, and protect the esthetic quality and reputation of the region for tourism.	Project C-23 in coordination with PRAEDAC Municipal Strengthening, Prefecture of Cochabamba, others as appropriate.	20 hours of training for 20 people; national short-term consultancy; $10,000

Mitigation Measure	Responsible party	Estimated cost
MM 17: SERNAP and TCO authorities will be consulted in the design, implementation and operation of all tourism investments under CONCADE that might affect lands under their jurisdiction. Grantees and implementing parties must obtain formal approval by the appropriate level of authority before grants can be approved.	Grantees and CHF	Negligible; part of routine operations
MM 18: Assistance will be provided to SERNAP and TCOs in development of tourism development plans as part of ongoing resource planning initiatives within areas under their respective jurisdictions. This will be done using information and data that is readily available from past studies.	Project C-23 in coordination with PRADEDAC, SERNAP, CIPTCO	National short term consultancies; 6 person-months; $20,000
MM 19: Efforts should be made to reactivate the region-wide environmental planning committee created in 2000 under the leadership of the Dirección de Recursos Naturales, Prefecture de Cochabamba to assure coordination in land-use planning, implementation of Bolivian natural resource and environmental regulations, and assessment of cumulative impacts to the region's environmental that might prejudice development of the tourism sector. In lieu of working with the Prefecture, a similar effort could be made through the Cochabamba Tropics Mancomunidad.	Cochabamba Prefecture, Project C-23, DAI, and other members	Negligible; part of routine operations
MM 20: Greater engagement with and support to the Chamber of Hotel Operators in the Cochabamba Tropics will be encouraged to discuss how this important interest group could be a more effect advocacy group for conservation of the region's natural attractions; broaden its membership to include community-base operators; and encourage measures by its members, either collectively or individually, to improve the quality of the nature-based tourism experience of their clients (code of conduct, safety, EMS, protection of important natural attractions, etc).	CHF, Chamber of Hotel Operators, others as appropriate	Seminars, meeting, site visits, etc. $20,000
	Total (over a 2-year period)	**$146,500**

In addition to these specific measures for the mitigation of environmental impacts caused by tourism investments in the Chapare, the PEA Team also developed a list of overarching recommendations would improve overall environmental management in the CPA. These observations and recommendations may be found in Annex 8 to this report.

Program monitoring of tourism investments are the responsibility of CHF International and grantees. In keeping with its role for other CONCADE components, Proyecto de Apoyo al Manejo, Conservación y Explotación de los Recursos Forestales en Trópico de Cochabamba (C-23), will provide independent oversight. Nonetheless, it is important that tourism operators in the Chapare, whether grantees or not, come to understand the importance of sound environmental management of their operations as an essential part of their competitive edge in the nature-based tourism market. Likewise, municipal governments must become more cognizant of how development planning decisions will enhance or diminish the region's potential for nature-based tourism. Finally, as noted above, there is an urgent need to strengthen environmental management across the alternative development projects and municipal development plans in the region. Specific monitoring tasks and responsibilities with estimated costs are included in the summary table of mitigation measures (see above).

1. Introduction

1.1 Background

In 1998 the United States Agency for International Development (USAID) designed and funded the expanded Chapare alternative development program, commonly known as CONCADE (Counter Narcotics Consolidation of Alternative Development Efforts). CONCADE provides licit economic opportunities to coca leaf producers in the Chapare. The Chapare (Map 1.1) is the region where most of Bolivia's illegal coca is produced. Through CONCADE, USAID, the Government of Bolivia (GOB), and other governmental and non-governmental organizations, have been implementing a wide range of alternative development (AD) programs, varying from export-oriented agriculture to improved transportation infrastructure.

Having determined that some of these AD activities had the potential to cause significant environmental impacts, in 1998, USAID conducted an Environmental Assessment (EA) to evaluate the potential impacts and recommend mitigation measures anticipated under the CONCADE program (Kernan, 1998; see Annex 1). This EA did not consider potential investments in the tourism sector. By 2000 coca eradication had exceeded original estimates by such a large margin that over 11,000 additional families were added to the AD program requiring a substantial increase in the scope and funding needed to support the CONCADE program. A Supplemental EA (SEA) was prepared to ensure that environmental concerns were adequately integrated into the design of this expanded program and to evaluate the applicability and effectiveness of the mitigation measures proposed in the original EA (Kernan, 2001; see Annex 2). Although tourism, including eco-tourism, was mentioned in the SEA under the investment promotion AD program, these activities were not evaluated in sufficient detail to meet the requirements of the 2001 threshold decision issued by the USAID Bureau Environmental Officer (BEO).

USAID has recently identified tourism as an area of likely investment under the CONCADE program mainly through the grant program managed by CHF International (CHF). To assure compliance with Agency environmental requirements, this PEA was developed to supplement the findings of the original EA and subsequent SEA in order to add tourism to the menu of activities which might be supported under the USAID Alternative Development in the CONCADE project area (Map 1.1 on the following page). The PEA does not repeat the findings of other CONCADE environmental assessments except where their findings are directly related to the tourism sector and related activities**.**

2. Rationale

USAID investment in the tourism sector of the Chapare is to be managed as a component of the CONCADE program as are other AD activities. The addition of tourism investment activities is important as it would provide a new avenue for regional development based on a non-agriculture economic activity that could generate income and job opportunities to rural communities and does not rely on the consumptive use of natural resources. As a component part of the CONCADE program, investment in the tourism sector will likely take a variety of forms depending on prevailing market conditions and other regional development activities.

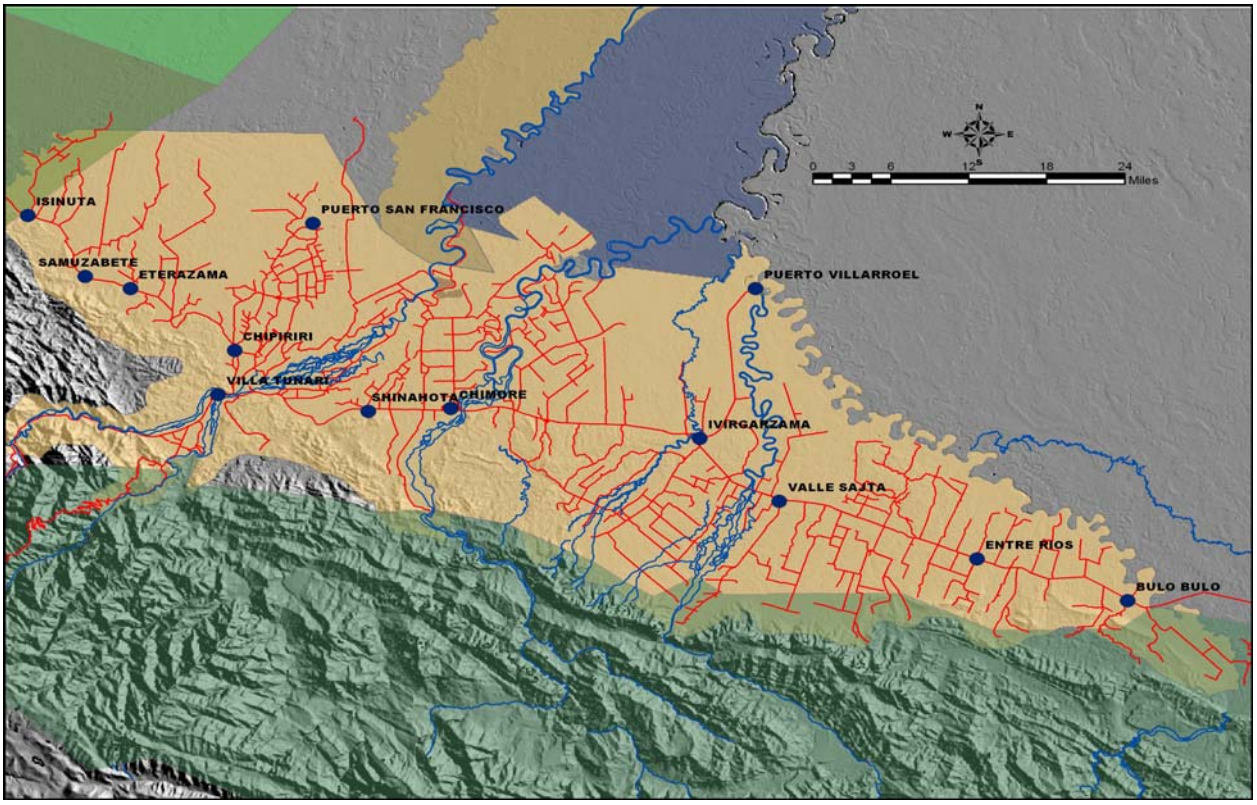
All USAID-financed activities are subject to regulations, laws, norms and standards of both USAID and Government of Bolivia (GOB). Both GOB and USAID manage environmental impacts of development activities through a series of environmental procedures used to identify and mitigate, avoid, or eliminate adverse short-and long-term impacts to the environment. A description of applicable U.S. Government and GOB regulations, as well as a flow-chart outlining the environmental review process, can be found in Annex 5.

This report is comprised of three reports: 1) PEA in accordance with 22 CFR Part 216; 2) an environmental guidance manual to be used in screening prospective projects to assist with developing the necessary mitigation of potential negative environmental consequences associated with proposed tourism investments; and 3) a case study for the application of the guidance manual to a typical hotel complex in the region.

2.1 Approach and Methodology

Subsequent to a review of the available historical and programmatic documentation, the PEA Team conducted a series of interviews with members of the USAID/Bolivia Alternative Development and Environmental SOTs (See Annex 6). Through these interviews the team was able to ascertain a more complete and up-to-date picture of the nature and scope of the proposed activities than provided simply in the documentation.

Map 1.1
Chapare – CONCADE Program Area



During the time spent in Cochabamba and the Chapare, the PEA Team met with stakeholders from all areas of the tourism sector. The PEA Team traveled throughout the region (Map 1.2)

and interviewed key informants in Chimoré, Villa Tunari, Ivigarzama and other major population centers in the region. Visits were made to fringe areas, adjacent parks and indigenous lands when safety permitted. While in the Chapare, the PEA Team took every opportunity to consult with stakeholders, including farmers involved in alternative development activities, officials from national, regional and local governmental institutions, and professionals in participating NGOs.

The C-23 Project was very cooperative in providing sufficiently broad information on the region's natural resources, infrastructure, socio-economic data, and geography for the baseline for this study.

2.2 Limitations of the Study

During the preparation of the PEA, USAID/Bolivia actively participated in ongoing discussions about the viability of investing in tourism activities in the Chapare. No specific programs, plans or priorities for the tourism sector had yet been generated; therefore, the PEA focuses more on the sector as a whole, rather than specific investments. The PEA Team used the current status of tourism in the Chapare as the baseline for the study, considering ongoing tourism enterprises and attractions as examples of the types of activities and investments that may be made in the future with support under the CHF grants program.

3. Purpose and Scope

3.1 Purpose and Need

The addition of tourism activities to the CONCADE program is in response to discussions with regional investors and in recognition that the region has historically been a tourism destination, mainly for a national clientele. While the vast majority of CONCADE activities have been based on consumptive uses of natural resources (i.e., agriculture), the presence of large areas in national parks, the geographic location of the region at the foothills of the Andes and a relatively well-developed infrastructure suggests that significant opportunities exist for tourism development. Pressure on adjacent parklands is severe, however, with colonists increasingly moving into poorly protected parks in search of land often to grow coca. For this reason, the PEA also addresses the potential negative environmental impacts generated by investments in tourism associated with increased visitation and demand on natural resources.

3.2 Scope

A premise of the PEA is that USAID investments in tourism could include infrastructure; planning activities; and development of new tourism attractions supported by the grants program currently managed by CHF. Grants could include the renovation of hospitality facilities, development of regional attractions, nature centers, boat launches, and similar activities. Other activities might include planning and development studies, feasibility studies, and marketing efforts to increase regional appeal and further develop tourism markets. Again, at present no specific USAID tourism program has been developed. As a result, the PEA includes some degree of speculation regarding the likely forms future investments might take. Training of tourism operators and hotel staff might also be considered for funding under this program as well as a range of educational materials like nature guides.

In 2001, an extensive survey was conducted of actual and potential tourism attractions in the Chapare. The most important include:

- Oil birds caves (guacharos) – an attraction managed by SERNAP in which visitors take a short hike into Carrasco National Park to visit the birds.
- La Jungla – a private adventure tourism establishment comprised of canopy walks, zip wires, and ropes courses.
- Orchid park and museum – a privately run orchid farm with a small anthropological and botanical museum.
- Parque Machia – a small municipal eco-park where visitors can see wildlife.

At present these attractions are managed with a bare minimum of managerial and administrative capacity. Training provided through future tourism investments could contribute to significant improvements in customer service, and could substantially enhance the touristic experience. Moreover, investments in tourism could increase the variety of available amenities and attractions. The Chapare's primary asset as a tourism destination rests with its biodiversity, forests and rivers. Similar regions around the world have capitalized on these natural resources by establishing education and research facilities would attract researchers from universities and other institutions around the world. Biological field stations could present an invaluable opportunity for public and private investment partnerships, thereby contributing both to the economic development of the region and the conservation of the very resources that draw tourists to the area.

Of significant importance to the future of tourism in the Chapare, but beyond the scope of this PEA, is the addition and improvement of public infrastructure, municipal services, and assistance to non-tourism-based public services. Transportation and access were not contemplated under the PEA except as they relate to the enhancement of existing routes to improve tourism potential: for example, signage, clean-up activities, or the improvement of scenic overlooks coupled with interpretative elements, such as assistance with trash collection, provision of picnic tables, or historical and educational markers, with the objective of increasing the appeal of the Chapare as a tourism destination. What has been contemplated under the PEA is access as related to the development of nature trails, boating access, or access to camps and shelters for use by hikers and nature enthusiasts.

4. Alternatives Considered, Including the Preferred Alternative

4.1 Alternatives

The development of the alternatives considered under the PEA resulted from extensive consultation with USAID/Bolivia concerning the nature of privately funded tourism initiatives already underway in the CPA, the perceived potential for USAID to support similar initiatives as they might contribute to economic alternatives developed as part of the AD program and the input on the needs of other prospective stakeholders. Discussions focused on projects related to infrastructure repair, upgrading and construction, and development of tourism activities and attractions. The development of the alternatives presented herein was based on the stratification of the different levels of tourism initiatives and facilities.

4.2 Range of Tourism-Related Activities Considered

As part of this stratification, four basic levels of investment were identified and used to develop the alternatives considered under the PEA:

- Investment in construction, modification or rehabilitation of large-scale tourism facilities.
- Investment in construction, modification or rehabilitation of mid-sized tourism facilities.
- Investment in construction, modification or rehabilitation of small tourism facilities.
- Investment in development of tourism activities only.

Three categories consider development of infrastructure while the fourth focuses on the development of tourism activities and attractions. Table 1 summarizes the types of investment projects that would be included within each of these categories and serves to define each of the alternatives. Assistance provided to these initiatives might include development of standards of operations, guide and nature training, business planning, and the augmentation of marketing and promotion practices.

Table 1.Tourism Activities Contemplated as Alternative Development Activities

Category Name	Description	Representative Activities
Large-scale Tourism Facilities	Facilities of large scale typically including rooms, meeting space, amenities such as pool, sauna, in-house restaurant, designed to offer all-inclusive vacation packages with recreational activities provided on the premises such as golf, water sports, etc.	Construction or remodeling of resort hotel complexes. Design and conceptualization studies for resort complexes. Marketing development and market research for resort hotel complexes.
Mid-sized Tourism Facilities	Facilities offering rooms with some amenities, may or may not have in-house restaurant or limited meeting space. Not designed for all-inclusive vacation packages. May have amenities such as pool and sauna, but does not provide significant recreational activities on premise.	Construction and remodeling of hotel facility. Design studies and engineering studies. Marketing assistance.
Small-scale Tourism Facilities	Small hotels with a few rooms (5-10 for example), bed and breakfast, hostels, campgrounds.	Construction and remodeling assistance, design, and marketing assistance.
Tourism Activities Development	Nature-based tourism activities such as adventure tourism (river rafting), nature study, hiking and camping. Culturally based activities, fairs, festivals, etc.	Includes planning and marketing assistance, construction of infrastructure in public and private sector, planning assistance, training programs for tour operators. Infrastructure may include interpretative nature centers, trail development, boat launches, trail shelters, etc.

4.3 Development of Alternatives

Based on the above investment categories, four alternatives were developed to represent the options for USAID investment of tourism initiatives in the CPA. Table 2 describes each of the

four alternatives and adds a No Action Alternative, which would imply no investment in tourism in the Chapare through the CONCADE program. These alternatives are presented as a graded series with each successive alternative eliminating the highest level of financial support to infrastructure projects. In this way, the PEA examines the impacts of funding various levels of infrastructure development that correspond to fairly well-defined tourism market segments.

By organizing the alternatives in this manner, a clear comparison of impacts can be made between a program designed to support varying levels of infrastructure development and a program that would rely on market forces to provide infrastructure in response to improvements in the type and quality of activities available in the region.

Table 2. Summary of Alternatives

Alternative	Summary	Activities included	Description
No Action	No tourism activities to be included in the CONCADE program	None	Tourism will not be an element included for consideration as a possible development alternative under the CONCADE program.
Comprehensive support for tourism development	All categories of tourism activity are included for consideration in the tourism component of the CONCADE program. Investment in the new construction of facilities providing additional rooms for the region.	Large-scale Tourism facilities Mid-sized Tourism facilities Small-scale Tourism facilities Tourism activities development	The program will consider supporting all scales of tourism, including the construction of luxury resorts, small to mid-sized hotels, campgrounds and bed and breakfast facilities as well as tourism venues on private and public lands.
Preferred Alternative: **Mid-scale tourism infrastructure support and development**	Large-scale resort development eliminated from consideration in the project mix. All other categories of tourism development included for CONCADE consideration. No new construction adding to the regional inventory of room space. Room space related activities confined to repair, renovation and rehabilitation.	Mid-sized tourism facilities Small-scale Tourism Facilities Tourism activities development	The program will consider investments in upgrading facilities but will not participate in the development of large resort complexes. It will focus on smaller enterprises requiring lower levels of capital investment as well as tourism venues on private and public lands.
Small-scale infrastructure support and tourism activities development	Mid-scale resort development eliminated from consideration in the project mix. All other categories of tourism development included for CONCADE consideration. No new construction adding to the regional inventory of room space. Room space related activities confined to repair, renovation and rehabilitation.	Small-scale Tourism Facilities Tourism activities development	Under this alternative, the program will focus on the small-scale, small footprint, lodging facilities such as bed-and-breakfast operations, campgrounds, as well as the support for development of tourism activities and attractions.

Alternative	Summary	Activities included	Description
Tourism activities development	All support for development of lodging and associated facilities eliminated from the program. Focus is entirely on the development of activities and attractions.	Tourism Activities development	Support for development of tourism activities and attractions will be candidates for inclusion in the CONCADE program. No investment will be made to provide for hotels or other lodging facilities. Activities will include nature-based themes and other non-nature based activities designed to provide increased tourism attractions. Infrastructure development will be limited as it applies to development of tourism venues.

4.4 Description of Alternatives

4.4.1 Alternative 1, No Action

Under the No Action alternative, investment in tourism would be eliminated from consideration as a component of the CONCADE development mix. Hospitality infrastructure would be left to survive and develop within the context of regional market forces and USAID would not provide assistance to tour operators, hotel operators, tourism planners, or other entities in the regional tourism industry. The development of tourism venues would be left to private enterprise or other donor agencies. No assistance would be provided for the development of tourism-related nature-based activities such as hiking trails, river excursions, and interpretative nature centers. Local environmental impacts from existing operations would not be mitigated.

4.4.2. Alternative 2, Comprehensive Support for Tourism Development

By supporting a comprehensive tourism development model, USAID could make funds available for all types of tourism investment, including the development of all levels of tourism-related infrastructure, from large resort complexes to the development of small-scale bed and breakfast facilities. USAID, under the CONCADE program, could also provide funding for the development of both nature-based and non-nature based tourism to further broaden the range of available recreational activities in the region.

Potential investments for consideration could include:

- New construction of large-scale resort complexes, mid-sized hotel facilities, bed and breakfast facilities, campgrounds, and associated infrastructure.

- Renovation or rehabilitation of facilities of all sizes to improve their physical structure and/or bring them into compliance with Bolivian law.

- Funding for improved service facilities such as water systems, waste management facilities, and sanitary waste management for the tourism sector.

- Planning, design, development, and construction of tourism-related infrastructure including park facilities, interpretative kiosks or contact centers, multi-purpose park centers, trails, boat ramps, and so forth. Includes the development of multi-purpose educational facilities and field centers for supporting educational and research activities.

- Development of nature-based and non-nature based tourism activities including: support for trail development in the national park system; funding for festivals, fairs and shows; assistance in training and equipping outfitters and guides; and support for tourism travel and guide services; value enhancement activities such as natural resource research activities and regional information support.

- Support marketing and market development activities on a local, national and international level. Includes the development of marketing strategies, marketing plans and campaigns together with associated distribution materials.

4.4.3 Alternative 3, Mid-scale tourism infrastructure support and development; Preferred Alternative

This alternative excludes possible funding of large-scale resort complexes and the construction of new hotel accommodations. Activities under this alternative are designed to take advantage of the existing infrastructure as the platform for growing the sector and not add any new lodging capacity to the region. The objective of Alternative 3 is to improve infrastructure with the construction or rehabilitation of supporting facilities such as potable water systems and renovation of hotel facilities in the mid- and small-scale ranges. Support for the development of camping sites and small-scale bed and breakfast accommodations is included to provide increased capacity for the lower-end market segment. Recreational activities will be promoted to increase regional appeal. Alternative 3 includes support to all the levels of service and itinerary development listed in Alternative 2.

Alternative 3 is proposed as the Preferred Alternative as it meets both programmatic objectives of CONCADE with modest impacts to the environment that can be mitigated at reasonable cost. Additionally, the scale of possible investments is in keeping with the general trends of tourism development in the Chapare toward small and medium-scale operations; the level of financial support that can be reasonably expected under the CONCADE grant program as it is currently conceived; and the capacity of CONCADE implementing entities and prospective grantees to carry out required environmental management and monitoring activities.

4.4.4. Alternative 4, Small-scale infrastructure Support and Tourism Activities Development

Alternative 4 is a variant of Alternative 3 whereby no funding would be provided for large and mid-scale initiatives. Investments would focus on small-scale infrastructure and development of nature-based tourist attractions and destinations.

4.4.5 Alternative 5, Tourism Activities Development

Under Alternative 5, no funding will be provided for the development of tourism hospitality infrastructure of any scale. The program will support all types of tourism activity development including recreation facilities, tourism venues, fairs, shows, and other activities designed to increase the appeal of the region. Support for outfitters and guides and their activity programs

will be made available and necessary supporting infrastructure such as trails and boat ramps will be considered.

Under Alternative 5, development of infrastructure and hospitality installations would be left to prevailing market forces. Hotel improvements and room inventory will change as market conditions permit and investors will be driven by competitive forces to improve capacity and quality. The program will seek to improve regional appeal through the support of activity development for a wide range of visitors in a variety of interest areas. Infrastructure will be supported to stimulate the development of new tourism venues and take better advantage of resources.

4.5 Comparison of Alternatives

The key elements of all five alternatives presented in Table 4.5 on the following page relate to the development of new infrastructure versus the improvement to varying degrees of existing infrastructure. With the exception of the No Action alternative, all of the remaining alternatives seek to improve regional tourism potential by investing in the development of tourism activities or itineraries. New construction of lodging facilities is only considered as an element of Alternative 2. The remaining Alternatives rely on existing room inventories as the development base.

5. Affected Environment

5.1 Physical Environment

The CPA is located in the Department of Cochabamba on the eastern side of the Cordillera Oriental of the Andes mountains. The CPA lies on the alluvial terraces deposited within and to the east of the piedmont of Cochabamba and is generally composed of a gently sloping landscape interdigitated with numerous streams. The area is subject to intense agricultural production and colonization pressure. Known as a major coca producing region, the CPA became the subject of an intensive coca eradication program. The CPA crosses three provinces: Chapare, Tiraque, and Carrasco. The project area is surrounded by national parks and indigenous lands which occupy the lower drainage areas to the east and the mountains and most of the piedmont to the west.

Table 4.5 Comparison of Alternatives, Key Elements Matrix

Activity	Alternative 1, No Action	Alternative 2, comprehensive support for tourism development	Alternative 3, preferred alternative – mid-scale tourism infrastructure support and development	Alternative 4, small-scale infrastructure support and tourism activities development	Alternative 5, tourism activities development
Large Resorts		X			
Mid-scale Hotels		X	X		
Small Facilities		X	X	X	
Tourism Activities		X	X	X	X
Rooms Added		X			
New Construction		X			
Renovation			X	X	
Activity Infrastructure		X	X	X	X

5.1.1 Regional Geography

The CPA sits in the northeastern section of the Department of Cochabamba between 16˚45' and 17˚30' south latitude and 63˚15'and 65˚30' west longitude, and occupies the upper region of the Amazon Basin at the eastern foothills of the central Andes mountains. The Chapare covers approximately 33,000 km^2, or 56 percent of the Department.

As shown in Map 5.1 on the following page, the CPA contains parts of six municipalities, outlined in Table 5.1. It includes parts of the provinces of Chapare, Carrasco, and Tiraque.

Table 5.1. Surface Area of Tropical Cochabamba

		Tropical area	
Province	**Municipio**	**Size (km^2)**	**% of the province**
Chapare	Colomi	1,200	30
	Villa Tunari	20,766	100
Carrasco	Chimoré	2,817	100
	Puerto Villarroel	1,927	100
	Pojo	"*n.d.*"	~70
Tiraque	Tiraque	1,000	40
TOTAL		**32,810**	

Source: "Tropical Cochabamba Forest Program," 1998.

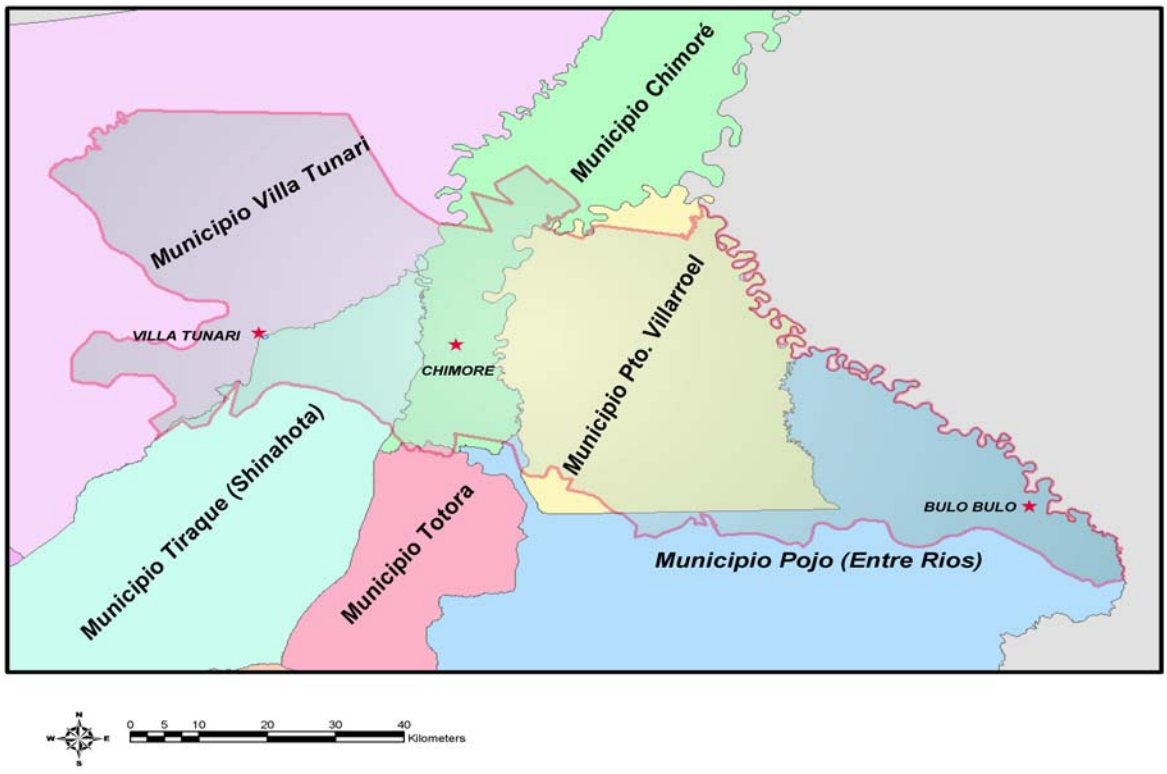
The Chapare includes three different physiographic zones: the eastern mountain range, the sub-Andean foothills, and the Amazonian plain. The CPA, as shown in Map 5.2 below, is largely situated on the Amazonian plain but includes some portions of the sub-Andean foothills as well.

5.1.2. Climate

The climate of the region is a result of a complex relationship between its easterly location with respect to the Andes, its proximity to the Equator, and the sharp changes in topography experienced in the region. Within a linear distance of 50 km, elevations can range from 200 m above sea level (m.a.s.l) within the CPA to 4,500 m.a.s.l. in the mountains to the west. This topography, coupled with the region's proximity to the Equator, results in a mix of climates with varying rainfall.

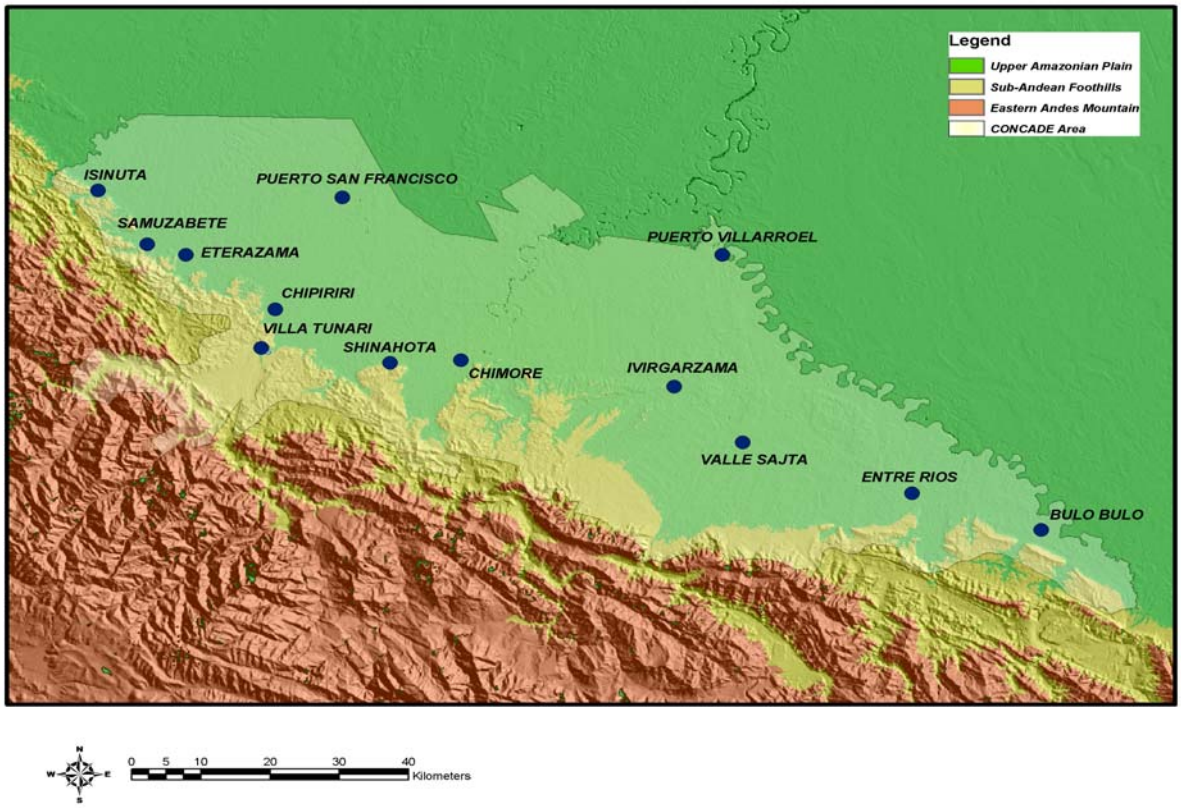
Using the Koppen system, much of the CPA falls within the Tropical Rainforest category with annual rainfalls in the vicinity of Villa Tunari reaching an average of 5,500 mm with peaks to 7,000 mm and tapering off to 2.500 mm as one travels east toward Santa Cruz. The regional distribution of rainfall reflects the orographic effect of the Andes with annual rainfall totals decreasing from south to north away from the mountains.

Map 5.1
Municipalities contained within the
CONCADE Area



Rainfall and temperatures in the CPA exhibit seasonal trends with lowest rainfall amounts occurring in the winter months. Maximum rainfall occurs between November and January and tapers off to lowest annual levels by the month of August. Annual temperature follows similar patterns with the warmest periods experienced during the rainy months: November to January. Average monthly temperatures range from 16^{o} to 27^{o} C drier winters and hot summers. In this climate temperatures remain relatively mild averaging from 16^{o} to 20^{o}C.

Map 5.2
Physiographic Provinces in the
CONCADE Region

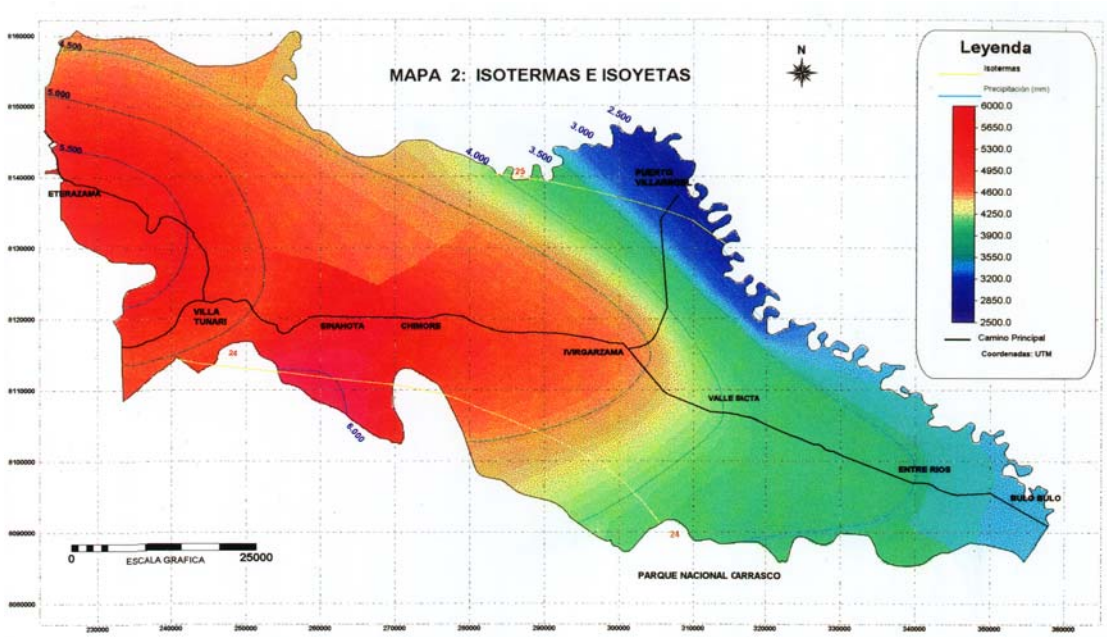


Due to the region's proximity to the Andean highlands and seasonal weather patterns, there are times when the CPA experiences the effects of a cold southerly weather system called a *surazo*. These are cold winds that arrive from the Argentine pampas and can drop the temperature in the CPA to as low as 5^{o}C. Temperatures as low as these are not typical of tropical regions and present a somewhat unique climatic situation that may affect the biological and agricultural character of the region.

5.1.3 Geology

The regional geology is typical of a piedmont environment with large areas covered in quaternary fluvial deposits resulting from erosion of the adjacent mountains. The CPA is relatively flat and is composed of fluvial plain below the piedmont rise along its southern margin. This area is the ancient floodplain for the numerous rivers which drain the adjacent mountains. Throughout history, these rivers have deposited large volumes of sediment in the region composed of sands, gravels, cobbles and boulders. Where exposed, particularly along the San Mateo and Espíritu Santo rivers, these deposits can range up to 2-4 m thick. This area is generally subtended by a sandstone formation (Figure 5.2) which has been cut by the two rivers to form a river cut of some 4-6 m deep in the vicinity of the fall line near the confluence of the rivers.

Figure 6.1
Temperature and Rainfall for the
CONCADE program area



Rivers in the region are rich in sand and gravels that are frequently mined for construction purposes (Figure 5.3). Large scale extraction is particularly evident on the San Mateo and Espíritu Santo rivers as they are easily accessible and contain high-quality gravel deposits.

Figure 5.2
Sandstone exposed river-cut

Sandstone cliffs created by river erosion. Note the fluvial sediment overburden above the sandstone.

Figure 5.3
Typical Riverbeds for the CONCADE Region

High quality riverbed sands and gravels in piedmont river systems are mined for construction material.

Confluence of Rio Espiritu Santo and Rio San Mateo at Tilla Tunari

5.1.4 Soil

The soils of the mountain ranges and hills of the eastern Andes vary from superficial to shallow, with medium to fine textures, are acidic and moderately fertile.

In the mountain ranges of the sub-Andean region, the soils are shallow to deep, with medium to moderately fine textures; acidic, with poor to moderate fertility. Soils on the Amazonian plains,

deep to very deep soil predominates, mostly with finer textures, which makes them compact, damp, and subject to different levels of flooding; acidic to highly acidic, poor fertility. A summary of the highest land uses for soil in the CPA is presented in Table 5.3.

Table 5.3 Highest land uses for soils in the Tropics of Cochabamba

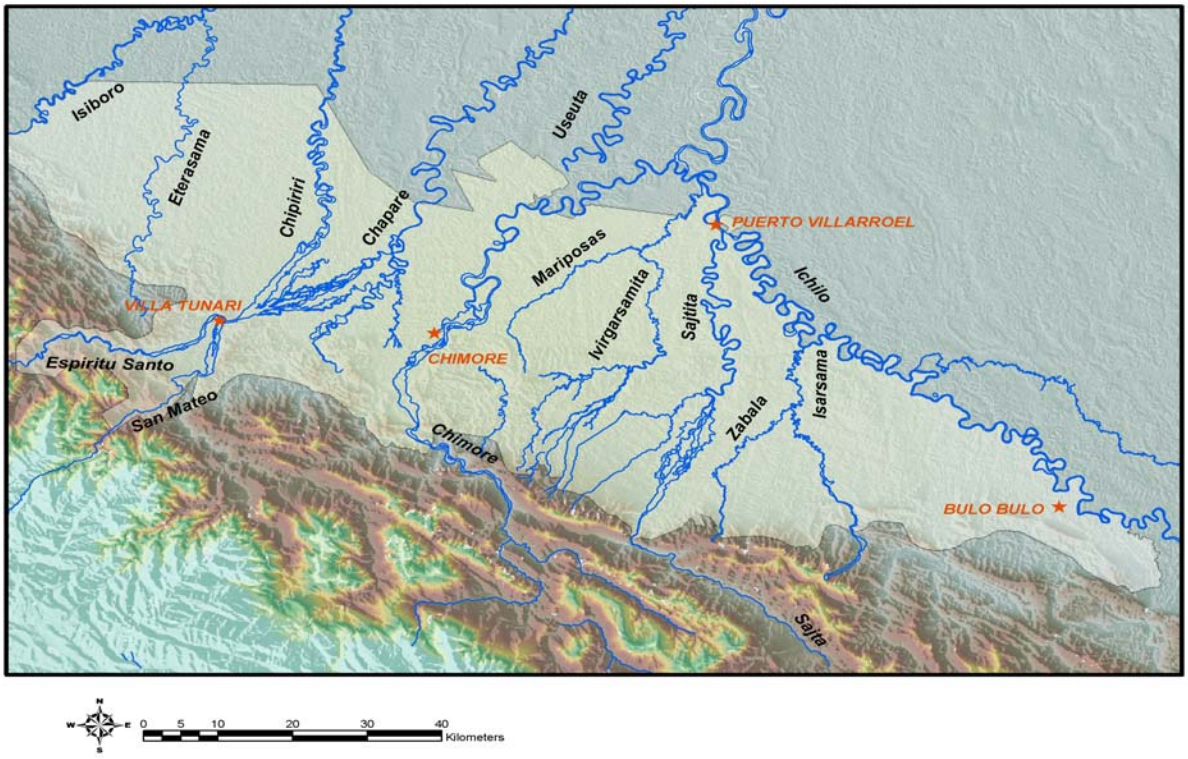
Type of land	Area (km^2)	%	Capability
Agrosilvopastoral use	1,500	4.6	Trees interspersed with permanent crops and livestock
Limited agrosilvopastoral use	1,200	3.6	Trees interspersed with permanent crops and livestock, with restrictions
Timber-yielding forest use	6,000	18.3	Permanent forest production
Limited timber-yielding forest use	8,310	25.3	Permanent forest production, with restrictions
Restricted use	5,200	15.8	Non-consumptive uses
Protected areas	10,600	32.4	Environmental protection
TOTAL	**32,810**	**100.0**	

Source: "Tropical Cochabamba Forest Program," 1998.

5.1.5 Hydrology

The CPA generally occupies the upper drainages of the Mamoré river in western Amazon river basin. The principal drainages in the CPA, presented in Map 6.2 on the following page are the Río Chapare, the Río Chipiriri, Río Chimoré, Río Ivigarzama and, along the eastern margin of the program area, the Río Ichilo. As elevation decreases from the southern margin of the program area to the north, soils become progressively more saturated due to the shallow groundwater levels. Indeed during the rainy periods in the region, many low-lying depressions are flooded, limiting access and serving as breeding grounds for mosquitoes. For this reason, land in the southern piedmont zone and toward Villa Tunari is preferred due to its drainage characteristics and soil composition.

Map 6.2
Principal Rivers in the
CONCADE Area



Groundwater in the area is close to the surface and easily accessible even with hand-dug wells. This proximity to the surface renders the resource susceptible to surface contamination and its utility is limited. Generally groundwater is found within a couple of meters of the surface in the CPA.

Watershed systems originate primarily in the mountains to the south. The present forest coverage promotes generally good water quality, however, due to the severe slope and relatively thin soils over rock, even minor disturbances in the ground cover can create major erosion. Slope increases with increased elevation in this region and, as a result, major landslides can be initiated with small sections of cover loss. The result can be a significant increase in soil loss as presented in Figure 5.4 on page 25.

5.1.6 Regional Infrastructure

The CPA is relatively well supported with respect to transportation and power distribution infrastructure but is generally lacking in solid waste, sanitary waste and potable water distribution systems. Two major hospitals serve the area with numerous clinics and dispensaries throughout the area. This infrastructure and services are an important foundation for the tourism sector.

5.1.6.1 Transportation

Transportation from the CPA to Cochabamba and Santa Cruz is managed via a single main highway which is paved throughout most of the route. Sections along the eastern side of the Andes are being repaired and upgraded and currently consist of a gravel surface all-weather road. Heavy truck traffic is common and bus service is available along the entire route. It is evident that the highway is well worn and deteriorated from use. Observations of present usage suggest that the large volume of over-weight trucks using the road contribute significantly to the current deteriorated condition.

At this writing, a critical bridge (Figure 5.5) at Villa Tunari is out of service due to a catastrophic failure of the eastern span section during a flood in December 2003. The present river crossing in managed by informal barge systems and efforts are underway to install a pontoon ridge as a temporary crossing. The estimated date for the completion of a new bridge is October/November 2004.

Within the region is a network of roads and trails in varying conditions. A USAID-funded program, *Caminos Vecinales*, is working to improve roads by converting them from dirt and gravel to cobblestone pavement. The program is active throughout the region and where roads have been improved, agricultural activity and rural settlement has intensified.

To date there is no regularly scheduled civilian air transport service to or from the area. A single airport is located in the vicinity of Chimoré but that facility is actively used by the military in the coca eradication program, and there has not been sufficient demand for private investment in habilitating regular civilian air travel to the airport at Chimoré, although all the necessary infrastructure is in place. In fact, at this time, special permission must be secured from the military even for civilian overflight of the CPA.

Rivers form an important part of the regional transport network but transportation is limited to destinations down river from Villa Tunari. Traffic moves from Puerto San Francisco, Puerto Villarroel and other locations to the north to downstream destinations including the Beni.

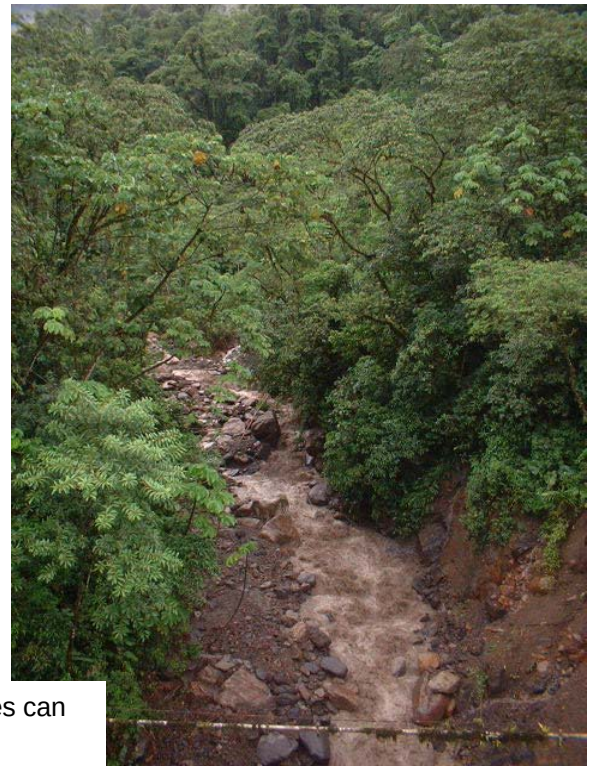
5.1.7 Utilities

Electric power is readily available and reliable based on observations in most urban areas as well as many rural centers. The region is supplied by two generating sources: one hydroelectric and one an LNG fired plant. The national power distribution line passes through the CPA.

Solid waste and sanitary waste treatment are virtually non existent. A sewer system, of sorts, exists in the vicinity of Villa Tunari but discharge is direct without significant treatment. Local facilities, houses and other activities discharge to their own septic or discharge systems. Solid waste is largely managed on an individual basis, tossed or buried on site. Municipal collection is very limited and ultimate disposal is to a dump area with no effort to manage waste disposal.

Figure 5.4
Two headwater streams of the CONCADE
Area River System

Good watershed management practices maintain high water quality -



But careless land management practices can result in instant stream losses.

Drinking water is supplied by various collection systems using sources typically located in the upper piedmont areas to the south. A typical freshwater collection system, presented in Figure 5.5, consists of stream water collection system located up stream in significantly protected and elevated area which is then connected to a distribution line.

Water is conducted down the mountain by gravity to the local distribution system. In some cases, water may be treated with chlorine prior to distribution to users but such treatment is unreliable.

5.2 Biological Resources

5.2.1 Ecological Zones and Floristic Component

The CPA is located in the subtropical region of the upper Amazon basin. It borders on several biologically distinct ecological units which occur due to the unique climatic and topographic features of the area.

Following the terrain from northeast to southwest, elevation changes abruptly along the southwestern margin of the program area. This change in elevation, coupled with the latitude of the area and the local climactic conditions, has produced an interesting assemblage of life zones that cross between the tropical and subtropical latitudinal regimes. Depending on the system of classification used, one could identify numerous discrete zones which result from the various

microclimates created by the regions topography. To simplify the issue, the Holdridge Life zone classification was used to describe the region in ecological terms.

As presented in Map 5.4 on the following page, there are basically five principal Holdridge Life Zones represented in the study area. The largest of these in surface area is the *Tropical Wet Forest* zone. This zone occupies the lowlands north of the mountains and generally covers the entire CPA. It is characterized by generally warm temperatures throughout the year coupled with a large volume of annual rainfall. This is also the most disturbed forest type in the region as much of the land within the CPA has been cut for timber and converted to agricultural use.

The floristic component of the forest in this zone is characterized by dense evergreen tree communities of 40 to 50m composed of rapid-growing species such as *Ceiba pentadra, Hura crepitans, Terminalia amazonica, Dipterix odorata,* and *Swietenia macrophylla*. The pioneer vegetation, typically found on riverbanks generally consists of *Tessaria integrifolia, Gynerium sagitatum, Salíx humboldtiana,* and *Oplisnemus hirtellus*.

Along the southern margins of the CPA lies the *Subtropical Premontaine Wet Forest.* The change in elevation and increased complexity of the mountain topography depresses the annual temperature but maintains a relatively high rainfall for the area. Dense, mostly evergreen forest dominates the area but tree heights are typically less than 30 m. These communities exhibit a relatively high biodiversity and are characterized by palm trees associated with tree species such as *Euterpe precatoria, Astrocarium aculeatum, Iriartea deltoidea, Attalea princep.* Characteristic species include *Cardulovica palmate, Swietenia macrophylla, Cederla lilloi, Juglans boliviana, Myroxilum balsamum*

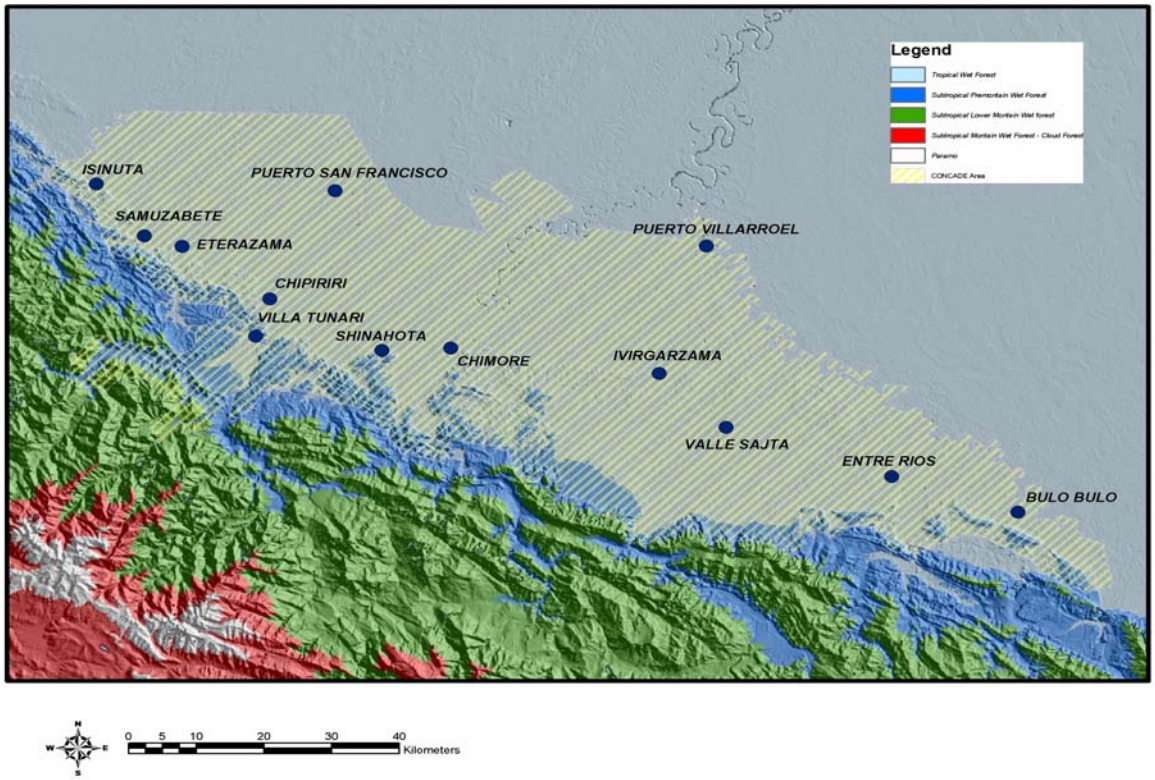
Figure 5.5
Villa Tunari Public Water Collection System

The *Subtropical Lower Montaine Wet Forest* component lies further up the mountain slope and is a dense, mostly evergreen assemblage with tree heights typically less than 25 m. Trees are typically covered with an abundance of epiphytes. Representative species include *Polylepis incana, Budleja andina, Baccharis spp, Escallonia racemosa, Esperomeles ferruginea,* and *Cyathea boliviana.*

The fourth zone is the *Subtropical Montaine Wet Forest*, or cloud forest, which is usually shrouded in fog with the relative humidity at 100 percent virtually 100 percent of the time. It is located in the higher parts of the eastern mountain range where the temperature remains relatively cool. This forest type is characterized by dense evergreen growth. The trees typically do not exceed 25 m in height. This forest is particularly rich in biodiversity owing to its key location within the mountains. This region of forest is particularly important for the protection of the upper mountain soils and watersheds. Representative species include *Cyathea boliviana, Myrica cerifera, Nephelea incana, Boconia frutescens, Brunellia coroicoana, Weinmania microphylla, Weinmania crassifolia, Fucchia boliviana, Freziera angulos,* with a rich assemblage of epiphytes.

The last zone is the *Paramo* located at the top of the mountains at an elevation of approximately 4,000 m, the Paramo reflects the effects of both temperature and rainfall reduction. Much of the moisture has been removed from the easterly winds and cloud development is typically at a slightly lower altitude reflected in the cloud forest formation. Trees at this altitude are dwarfed and, at slightly higher elevations, near the crest of the mountain ridges, grasses dominate. This is likely an effect of human intervention as the elevation is not above the tree line for the region. The climate is cool and frost or sleet can develop as conditions permit.

Map 5.4
Biological Regions in the Vicinity of the
Concede Area (Following L.R. Holdridge)



5.2.2 Fauna

The region supports a diverse fauna however it is poorly known. The diversity stems from the varied habitats supported and the ecotones provided between the various life zones encountered. Significant modification of the natural habitat has occurred within the CPA, which has generally reduced the ability of the land to support the native species. These activities are generally limited to the piedmont and upper Amazon plain sections of the CPA where agricultural activity is most intensive.

Vertebrate species are characterized by a mixed assemblage, reflecting the tropical and subtropical components of the region. Monkeys are found in the lowland areas representing the genera *Cebus, Alouatta, Ateles, Saimiri, and Aotus.* Cats are known from the area and may include ocelot – *Felis pardalis;* margay – *Felis wiedii;* jaguarondi – *Felis yagouaroundi,* and puma or mountain lion – *Felis concolor.*

Bats are well represented by seven families, including Emballonuridae (Sac-winged bats); Mormoopidae (Leaf-chinned bats); Noctillionidae (Fishing bats); Phyllostomatidae (Leaf-nosed bats); Vespertillionidae (Evening bats); and Molossidae (Free-tailed bats).

Hunting is common and supplements the diet of colonists and indigenous communities. There is a significant market for forest meats in the restaurant industry with numerous local species, including Peccarie (jochi, puerco de monte) – *Tayassu pecari albirostris, Tayassu tajacu,* Brocket Deer (venado) – *Mazama Americana, Mazama gouazoupira,* Agouti (Anuje) – *Dasyprocta variegate,* Paca (conejo pintada) – *Agouti paca,* Armadillo – (taitetu) *Dasypus novemcinctus, and* Tapir (anta) – *Tapirus terrestres.*

Fishing pressure in the CPA seems to be high with anecdotal accounts of falling harvest over the past 15 or so years. Fishermen indicate that they are traveling further and further down river to make their catch. Interviews also indicate that individual fish sizes are declining as well. Fish are harvested for regional consumption and export to markets in Cochabamba, Santa Cruz and other Bolivian cities. A fishing season has been established by law, and fishing is closed from December to March. According to interviews with local fishermen, the season is variously observed. Commercially important fish species include: Pacu – *Colossoma macropomum;* Dorado – *Salminus maxillosus, S. brasilensis*; *and* Suribi – *Pseudoplatystoma sp.*

Reptiles found in the region include a variety of poisonous snakes of the genera *Bothrops, Micrurus,* and *Crotalus.* Non-poisonous species include boa constrictors, vine snakes and others.

Finally birds in the region consist of a tropical-subtropical mix with a migratory component. Parrots are still relatively common in the CPA along the less developed fringes. Macaws are uncommon and within the CPA. Other birds observed reflect species tolerant to human activity such as orpendolas, doves, flycatchers, anis and others.

5.2.3 Species of Concern

Species of concern for the CPA were identified using CITES Appendix I and IUCN Red List citations. Lists for Bolivia were examined and species which may possibly occur in the CPA were selected for inclusion.

CITES is the Convention on International Trade in Endangered Species of Wild Fauna and Flora and has been ratified by Bolivia. Species are identified under CITES by their listing in either Appendix I Endangered Species; Appendix II Threatened Species; or Appendix III Species for Which Cooperation in Trade Control is Requested. Annex 9 contains the listing of species possible in the CPA which meet the criteria for Appendix I – Endangered Species under CITES.

The IUCN Red List is maintained by the World Conservation Union, Species Survival Commission to focus attention on endangered and threatened species worldwide. The IUCN Red List has been maintained for almost 40 years in its various forms. Annex 9 also presents the IUCN endangered species which could occur in the CPA. This listing is compiled by the IUCN using their criteria version 3.1 as contained in the *2001 IUCN Red List Categories and Criteria Version 3.1*.

5.2.4 Tropical Forest Resources, Protected areas, and Lands with Special Status

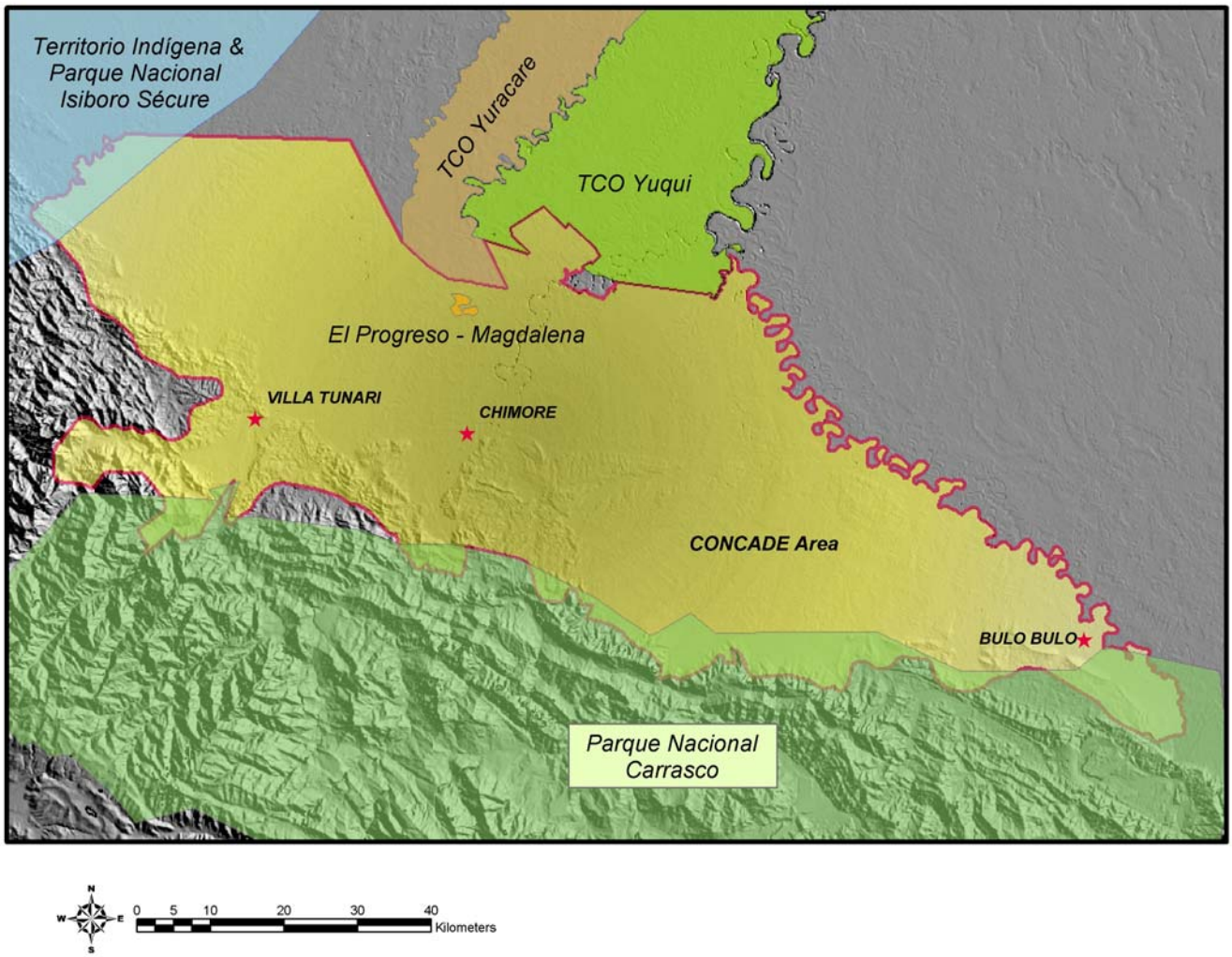
More than 65 percent of the colonized area of the Chapare is still covered with secondary and primary forests. Lands in two indigenous reserves and three protected areas to the north and south still by and large conserve their original tropical and sub-tropical forest cover (see Map 5.5). More than 100 forest tree species have been identified of which 25 percent are currently marketable in large quantities and 25 percent are currently marketable in lesser quantities. The remaining 50 percent are considered to be without commercial value (Tropical Cochabamba Forest Program, 1998).

The Forest Program for the Tropical region of Cochabamba encompasses the following administrative areas:

- *Multiple Use Forest.* (Ministerial Resolution No. 066/92). Includes untouched primary forests and others that have been heavily impacted, significant expanses of secondary forest, and fallow land. This is the area where the forest companies still log.
- *Chapare immobilized forest.* (Ministerial Resolution No. 065/92). Includes primary forests with productive potential, suitable for forest concessions to private entities and local social associations (ASL, Spanish acronym).
- *Yuqui TCO.* (Supreme Decree No. 2311). Lowlands, principally with primary forest, with high potential for ongoing production.
- *Yuracaré TCO.* (Resolution RAI-TCO-0006). Lowlands, principally with primary forest, with high potential for ongoing production.
- *Carrasco National Park.* (Supreme Decree No. 22940). Includes the administrative centers of the settled areas between 350 and 4,500 m.a.s.l. with a high level of biological diversity, access in relatively good condition. The park currently has high importance and great potential for ecotourism. The park is threatened by agricultural expansion.

- *Territorio Indígena Parque Nacional Isiboro Sécure* (TIPNIS) [Indigenous Territory of the Isiboro Sécure National Park]. (Executive Order 07401/1965 and Supreme Decree No. 22610 of 1990). Forest lands between 200-2,500 m.a.s.l., with a high level of biological diversity, show medium to high potential for forest production in the lowlands. Currently covering almost 100,000 hectares, there is settled, strong human impact, heavy logging, and stockbreeding activities.
- *Private forest lands.* (Various legal instruments, concessions). Private properties located in the multiple-use forest area. Chapare immobilized forest reserve and native communal lands.

Map 5.4
Locations of
Protected Lands



5.3 Socio-Economic Characterisitics

5.3.1 Regional Economy

The economy of the Chapare is based primarily on agricultural production, oil and gas production, the production of hydroelectric energy, forestry use, fishing, and the farming and livestock sectors. The agro-industry, trade, and tourism are sectors that have developed recently and report notable growth. The economically active population makes up 53 percent of the total population. (Viceministerio de Desarrollo Alternativo, 1999, 2002).

Land cultivated for agricultural and livestock production covers 153,342 hectares. A wide variety of crops are produced:

Cultivated Area of Licit Crops in the Cochabamba Tropics

Crop	Cultivated Hectares (as of 2003)
Banana and Plantain	29,173
Citrus fruits	25,026
Perenial grains and vegetables	14,612
Yuca/Casava	6,410
Hearts of palm	6,434
Pineapple	2,937
Black pepper	432
Maracuya	178
New and combined crops	16,545
Subtotal: Licit crops	**101,747**

Source: CONCADE "Informe Trimestral – Octubre a Diciembre de 2003 y Resumen del Año 2003," Contracto USAID No. 511-C-00-99-00114-00, Development Alternatives, Inc., February 2004, Cochabamba, Bolivia.

Commercialization of farming and livestock products has been achieved through the intermediation of transporters and wholesalers who purchase 70 percent of the production of non-seasonal fruits (plantain, banana, papaya), and 85 percent of seasonal fruits (citrus and pineapple). Producers involved in alternative development agricultural production number 4,000 in banana production; 1,000 in hearts of palm; 30 communities in maracuyá (passionfruit); and 378 families in black pepper. Ninety percent of colonist families in the Chapare are involved in farming and livestock production. Labor for this production comes from family members and social reciprocity linkages.

Forestry extraction in the Chapare provides wood to the manufacturing industry in Cochabamba for both domestic and export markets. In 2000 the forestry sector generated US$5 million in added-value. There are 51,000 forestry management plans covering 173,093 hectares, 1,051 hectares in forestry plantations and 6,840 hectares of agroforestry systems which are associated with different tree crops like achiote, camu-camu, coffee, cocoa, rubber, improved pastures, etc. It is estimated that an average of 4,000 hectares of secondary and primary forest are converted to agriculture each year. The demographic profile of economic activity reflects the importance of agriculture, which is the primary activity of approximately one third of the economically active population in the region. By contrast, the tourism sector is still a small component of employment in the region, as suggested by the data on the hotels and restaurant sector, which

accounts for approximately 1.3 percent of the total economic activity in the Tropics of Cochabamba.

5.3.2 Tourism: National to Local Perspectives

National Level
The value of current tourism and its potential and limiting factors in the Chapare are not the explicit focus of the current study but do provide an important backdrop. Fortunately a few earlier studies have taken on the task of this analysis and are drawn on in the current study (EtnoEcoTur S.A., n.d.; Fundación Bolivia Exporta, 2003; McLaughlin et al., 2002). Furthermore, the European Union through its PRAEDAC program has made efforts to promote tourism in the region through a series of guides that describe history and attractions and point to potential attractions and outdoor activities (PRAEDAC, n.d.). This combined body of information points to a number of attractions, including wildlife and natural settings, indigenous culture, and other outdoor activities.

To put the actual and potential tourism in the Chapare into perspective, it is useful to identify tourism's role at the national and prefecture levels. The streams of tourists at these levels are relevant since they represent individuals who have already shown a willingness to visit the country. It is anticipated that some portion of these types of tourists could be attracted to the Chapare.

Activities and Expenditures of Foreign Visitors to Bolivia

Country of Origin	Median Stay	Median Expense per Trip	Median Expense per Day	Jungle Excursions	Visits to Archeological Ruins	River Trips	Cultural Activities	Recreational Entertainment
	(Days)	(US$)	(US$)	%	%	%	%	%
AVERAGE	10.4	500	50	NA	NA	NA	NA	NA
Germany	15.3	607	41	27.8	55.7	8	46.6	32.4
Argentina	8.4	375	52	5.3	21.7	3.8	25.9	48.6
Brazil	10.7	519	54	4.8	46.3	10.6	43.1	54.8
Chile	8	339	58	8.9	16.4	4.5	24.5	39.4
Spain	14.2	511	41	8.8	31.1	6.8	43.9	30.4
USA	11.4	570	60	12.1	32.9	8	36.5	50.2
France	14.7	632	48	22	57.9	9.7	66.4	44.4
Italy	11.8	446	49	9.8	57.6	4.3	40.2	39.1
Holland	13.4	928	72	16.6	56.6	6.9	67.6	50.3
Peru	6.1	274	50	3.8	20.5	--	34	51.9
UK	11.7	592	58	18.9	55.1	10.3	56.8	56.2
Switzerland	12.8	642	49	15.1	37.6	7.5	55.9	31.2

Source: Vice Ministerio de Turismo, Banco Central de Bolivia, & Instituto Nacional de Estadística, 2001. Encuesta Gasto del Turismo Receptor y Emisor 2001, La Paz, Bolivia.

At the national level, the general picture of tourism in gross economic terms suggests an important and dynamic sector with potential as a source of economic growth. From 1994 to

1998, expenditures by foreign tourists increased from US$123 million to US$200 million, an increase of over 60 percent. This growth was reversed in the latter part of the 1990s, with a decrease of 20 percent projected for the period from 1998-2000. Nonetheless, the typical expenditures suggest a sizable opportunity for the tourism facilities able to capture a part of it. As the following data show, foreign tourists spent an average of 10 days and US$500 per trip. These expenditures were distributed among the following items at the indicated proportions, on average: lodging (27 percent); meals (15 percent); domestic transportation (14 percent), recreation (13 percent); crafts (11 percent); and the remainder (20 percent), on other items. Furthermore, tourists from certain countries show an interest in the kinds of activities that might work to the benefit of tourism development in the Chapare. Specifically, German tourists exhibit a strong predilection for jungle excursions (28 percent). Less strong but still potentially important are the levels of interest shown in river trips. Approximately 10 percent of Brazilian, British and French tourists coming to Bolivia showed an interest in this activity.

Departmental Level - Cochabamba

The Prefecture of Cochabamba shown in Table 5.7 already receives a portion of the foreign visitors coming to the country. There were 34,575 foreign tourists who stayed in lodging in the city of Cochabamba in 2002. In this same period, 134,904 national tourists were registered as overnight visitors. Foreign tourists visiting Cochabamba represented 9 percent of the total flow of foreign tourists visiting the country. The number of national visitors to Cochabamba were equivalent to 18 percent of the total number of national tourists. The majority of the current foreign visitors come from surrounding countries (Peru, Argentina, and Chile).

Table 5.7

	Peru	Argentina	Chile	USA	Brazil	France	Germany	Israel	Spain	England	Resto del Mundo	TOTAL
TOTAL	5,635	3,922	3,632	3,333	2,186	1,529	1,513	1,255	1,030	1,025	9,515	34,575
Percent	16.3%	11.3%	10.5%	9.6%	6.3%	4.4%	4.4%	3.6%	3.0%	3.0%	27.5%	100.0%

The reality at the moment, though, is that the majority of visitors comes for very short visits and stays in inexpensive lodging. Twenty-three percent (23 percent) of the foreign tourists came in the month of August and 9 percent came in the month of July and in the month of November. The peak month for national visitors is August (22 percent of the annual total). Almost 21 percent (20.5 percent) of foreign tourists stayed in one-star “residenciales,” 16.4 percent in four-star hotels, and 9.1 percent in five-star hotels. Almost 19 percent (18.5 percent) of national tourists stayed in Class C lodging (“alojamientos”), 16 percent in one-star “residenciales,” and 10.1 percent in Class A lodging. The average stay in lodging establishments was 2.4 days for foreign visitors and 1.7 days for Bolivian visitors to Cochabamba. (Vice Ministerio de Turismo, Ministerio de Desarrollo Económico, n.d.).

In principle, there is a reasonably good-sized pool of visitors already coming to the Prefecture, some portion of whom could be diverted to the Chapare. And, as was the case at the national level, this sector offers prospective of a notable (although not large) contribution to the local economy. Data on the economic output associated with the hotel and restaurant sector in the Cochabamba prefecture indicate that it constituted 3.6 percent of the prefecture's Gross Domestic Product in 2001 (US$47 million) (INE, 2003).

Regional Level - Tropics of Cochabamba
The reality is even more problematic for the Chapare. Only a small number of visitors come to the region. There are a number of reasons for this phenomenon. In the best of times, the pattern of visits by national tourists to the region is dominated by long weekend stays on a few key holidays during the year and longer stays during the Christmas holiday. On these occasions, the lodging facilities can be filled to capacity. However, political conflicts (manifested as blockades) have created a stigma that certainly makes potential foreign tourists disinclined to visit the region and have in the recent past physically interrupted and/or blocked entry by tourists on peak holidays. Furthermore, the travelers passing through the region traveling between Santa Cruz and Cochabamba show little inclination to spend time in the region. It was suggested to the PEA Team that national tourists do not have a strong tradition of driving vacations of the type that would bring residents from Santa Cruz or from Cochabamba for overnight stays during transit between the two cities.

In the Chapare, best estimates for current lodging occupancy range from 8 to 12 percent in recent studies (McLaughlin et al., 2002; Fundación Bolivia Exporta, 2003) for a maximum lodging capacity of between 600 to 700 visitors per day. This low occupancy is a product of many factors, including the direct effect of the blockades that have severely stymied all economic activities, including tourism, at times in the recent past, as well as the dampening effect of the Chapare's being stigmatized by security concerns. One offsetting factor observed by the PEA Team was the number of consultants and project employees who provide an occupancy base during the workweek, not only in Villa Tunari but in other locations in the region as well. These clients do not constitute tourists per se but do help some of the establishments stay in business.

Based on the levels of occupancy and capacity indicated above, the PEA Team estimated that lodging facilities (hotels, alojamientos, and hostels) in the Chapare currently receive about 20,000 to 30,000 visitor-days per year. Information gathered in the field and from secondary sources suggests upper range estimates of US$30, $3, and $8 per visitor-day for lodging in hotels, "alojamientos," and hostels respectively in the region. Added to lodging expenditures there are costs of food, transport, and other activities. The PEA Team estimated values of US$6, $5, and $5 respectively for each of these items for a total of US$16 per visitor-day in typical non-lodging expenditures. Taken together, these estimates imply total annual expenditures of US$800,000 to US$1.3 million in the hospitality sector (which includes lodging, food, and a modest amount of tourist activities). These figures suggest that tourism is a very small factor in the regional economy at this time, a finding that is consistent with the PEA Team's experience in the field.

Notwithstanding current conditions, the PEA Team encountered a notable interest from numerous quarters in what tourism could become in the region. Tourism in the Cochabamba

Tropics has the benefit of having areas of singular beauty and ecological richness, such as Carrasco National Park, the Indigenous Territory and National Park of Isiboro Sécure, and the Yuqui TCO. Moreover, discoveries of new potential attractions have become more frequent recently. Efforts funded by USAID and PRAEDAC have brought new tourism attractions to light. In a small way at least, it appears that a new social phenomenon has been set in motion – the search for new potential attractions. The PEA Team also became aware of at least one case where a municipality has brought a new natural attraction to the public's attention. The site – identified in the vicinity of Shinahota – is a daily gathering of dozens of parrots in one location, dubbed as the Parliament of Parrots ("parlamento de loros").

5.3.3 Population

Table 5.6 shows the distribution of inhabitants in the Tropics of Cochabamba by municipality.

Table 5.6 Population of Tropics of Cochabamba

+Province Division	Capital of division	Total Population	Urban Population	Rural Population
Chapare				
Division III	Villa Tunari	53,996	8%	92%
Carrasco				
Division IV	Chimoré	15,264	25%	75%
Division V	Puerto Villarroel	39,518	16%	84%
Tiraque				
Division I	Tiraque	35,017	12%	88%
(includes Shinahota)				

Source: 2001 National Population and Housing Census. The data presented above include the entirety of Division I of the Tiraque province because it was not possible to separate the population that lives within the Tropics of Cochamba (including, for example, Shinahota) from those who live outside it.

The majority of the population speaks Quechua as its mother tongue. Aymara is the third most common mother tongue after Spanish. The indices of social development in the area indicate gaps in meeting basic needs in 2002. Less than 8 percent of the population had access to sewer services; just 28 percent of the inhabitants had access to drinking water systems; and approximately 20 percent of the population does not know how to read or write.

The population of the Chapare region consists of two groups that are strongly differentiated for historical, ethnic, cultural, and socioeconomic reasons: on the one hand, the bulk of the population, the settlers, and on the other, the indigenous peoples of the lowlands, such as the Yuracaré and Yuqui. Thus, the socioeconomic description will also be vastly different. Detailed information on each of the demographic groups in the Chapare can be found in Annex 10.

5.3.4 Context: Economy, Demographics, Social and Ethnic Structure, Political Climate

The single best summary indicator of the economic conversion that has taken place in the CONCADE region is the dramatic reduction in illicit coca production from 35,000 hectares in the late 90s to approximately 6,000 hectares in 2003. Making this conversion possible were substantial investments in new agricultural crops, agroindustry, agricultural extension, roads, schools, electrification, drinking water supplies and other services and infrastructure. Without a

doubt, the socioeconomic profile of the CONCADE region today contrasts sharply with what it was even five years ago.

Migration into the area is occurring at a quick pace. According to data provided by DAI, estimates for the late 90s and early 2000s suggest the addition of 3,000 more people per year to the CONCADE region (Castañeda et al., 2002). In the overall area known as the Chapare, constituted by four municipal sections and their associated seats of government (Villa Tunari, Chimoré, Puerto Villarroel, and Tiraque [Shinahota]), there were 143,795 people in 2001.

Transformations of the natural environment clearly coincide with this population growth and with significant structural changes in the region's economy. The Cochabamba-Santa Cruz route is the only major highway connecting these two cities. Estimates in the print media suggest a traffic flow of approximately 2,200 vehicles per day in times of normal movement (El Deber, 2004). The amount of improved roads ("caminos vecinales mejorados") almost doubled during the period 1995-2001 (from 481 km to 841 km), while the length of farm-to-market roads ("empedrado," or, cobblestone) almost tripled (from 42 km to 147 km), (Castañeda et al., 2002). Older forests (known variously as "bosque cerrado" or closed forests or primary forests) diminished by 33 percent in the CPA during the same timeframe (from 264,113 hectares to 175,552 hectares). Indications are that these trends have continued in the subsequent two years.

This kind of transformation brings with it a tremendous increase in social pressures too. A backlash from certain coca growers against efforts to reduce illicit production has resulted in political protests and blockades that paralyze the region. The resulting conflicts have stigmatized the region for potential Bolivian and foreign visitors alike, who are reluctant to enter the Chapare. Despite their protests, farmers who produce coca continue to be marginalized by the alternative development process and eradication efforts. More and more, their cultivation of coca takes place in more remote parts of the region, including within the boundaries of the Carrasco National Park that serves as the southern boundary of the CPA. Coca producers have on occasion threatened park rangers responsible for protecting its natural resources.

The populations living in indigenous lands (native indigenous and non-indigenous communities) within the CPA are estimated to include 7,200 people (Romanoff, 2002). Their locations include the Yuqui TCO; the Yuricaré TCO; part of the Indigenous Territory in the Isbibiro Sécure National Park; and three indigenous communities San Salvador (Río Chimoré); Río Sajta; and Progreso (Río Chapare). The principal ethnic groups in these areas are the Yuricaré, Trinitorio (or Moxos), and Yuqui, as well as some other smaller ones. Indigenous populations have the potential to become a greater part of the tourist trade through the sale of artisanal products (building for example on current production of furniture and other items) and through hosting tourists who come to the communal lands to experience indigenous culture.

6. Public Consultation and Review

During the development of this EA, meetings were held with key personnel and public representatives as well as a variety of representative individuals in La Paz, Cochabamba, and towns and villages in the CPA. Interviews were conducted throughout this study with hotel operators, farmers, fishermen, restaurateurs, public administrators, elected officials and others to gather a broad insight into the thinking of the affected public and institutions. Interviews were

also taken with various entrepreneurs in the area not necessarily related to tourism to broaden the perspective of this study.

The PEA Team conducted a broad assessment of stakeholders in past, current, and future tourism initiatives in the Chapare, which was carried out through a baseline inquiry of what has worked and what has not worked and of who gains and who does not gain from tourism.

Annex 6 presents the list of persons contacted during this study and their affiliation. Despite the difficulties with dispersed location, the PEA Team managed to get a broad representation of persons potentially affected by the introduction of a tourism component to the alternative development mix. Major issues raised by interviewees related to the lack of public infrastructure to support development, rapid loss on natural areas due to colonization, reductions in fish harvest, and regional social turmoil. Other issues included regional infant mortality problems, communicable disease such as tuberculosis, over hunting and of course transportation. The majority of persons interviewed were in favor of increased tourism for the region as it is seen as an alternative to land intensive agricultural initiatives. Many of the issues which were volunteered by interviewees were not directly related to environmental concerns related to expanded tourism development. Rather, many of the concerns presented by local stakeholders were related to the real and perceived inequalities created by the injection of donor funds into the region. While these issues are not at the crux of the tourism sector, and do not fall under the purview of this PEA, the PEA Team thought it important to include these issues and suggestions for mitigation their potential impacts, as they do make up an important component part of development initiatives in the region. The issues and suggested responses are highlighted in Annex 7 to this report.

The results of the stakeholder interviews were incorporated into the design of the Alternatives studied under this PEA and in the development of the subsequent impact analysis and environmental management strategies to be employed.

7. Environmental Consequences from the Tourism Sector

As a function of the CONCADE program, tourism development is probably the least likely component to be associated with significant negative regional environmental consequences. Aside from the obvious construction and visitor related impacts, tourism is not an activity that requires extensive land conversion. The majority of tourism-related impacts result from an increased strain on public services and in the management of pollution rather than the wholesale conversion of acreage and consumption of resources. Food, water, waste disposal and transportation access are probably the most significant areas of impact.

From another perspective, tourism is likely to be adversely impacted by other CONCADE development activities. Loss of forest cover, stream pollution from agricultural runoff, pesticide usage and other impacts from non-tourism activities are already shaping the region’s future and have the potential to disrupt the future feasibility of regional tourism investment. An example of this is the high level of coliform bacteria counts in the region’s river systems from untreated human and animal waste. Such effects, if widely publicized, could be very detrimental to the tourism image of the Chapare.

This is not to say that tourism development is without its problems. The tourism investment component of the CONCADE program would make funds available for the development and/or expansion of businesses that are based on the use of Chapare cultural and natural resources including park areas. These activities, however economically beneficial to the region, if not properly planned or managed, could result in significant negative environmental impacts. Within the context of the CONCADE program, and indeed in the context of regional development, tourism must be viewed as but one component of a larger effort. It would be a serious mistake to try to treat tourism investment as an unrelated development theme as it cannot be separated from the cumulative impacts of other regional development programs.

Three previous environmental assessments have been conducted covering the various aspects of the CONCADE program: 1998 Environmental Assessment, 2001 Supplementary Environmental Assessment, Pesticide EA in 2002, Silvo-pastoral PEA in 2003 (Annex 3). As part of the larger effort, tourism environmental impacts are a minor contributor to the impacts associated with the myriad of other program elements. While no attempt has been made in this analysis to duplicate the efforts of the previous studies, they must be considered together with the findings of this work to assure adequate environmental protection is maintained. Absent this approach, the conflicting objectives of the individual development strategies will continue to incur cumulative negative impacts that could ultimately affect the region's ability to sustain its economy.

7.1 Summary of Potential Impacts of Proposed Alternatives

Although tourism is thought of as a clean industry, the potential for adverse environmental consequences from uncontrolled tourism development do exist. Most of the impacts are linked to the construction of infrastructure such as roads and airports, of tourist facilities such as hotels and restaurants, and the demands of the tourist clientele for local services.

The most significant consequences are related to the physical footprint of tourism facilities. Second to this is the management of waste materials (solid and sanitary), which are generated by the tourism sector. Third is the demand for local resources: food, water, transportation. Finally there are impacts associated with use of rivers, lands, and cultural interchange as tourists engage in their recreational activities.

Within the context of the CONCADE program, the most significant impacts that tourism development could present are those associated with new construction. These however, have been virtually eliminated by the selection of the Preferred Alternative "Mid-scale tourism infrastructure support and development." Under this alternative, new construction of tourism facilities would not be supported by CONCADE, only upgrading of existing infrastructure. Any construction contemplated under the Preferred Alternative would be of very small scale related to trails, river access, nature centers and similar activities and attractions.

Positive consequences from increased investment in the tourism sector would be to provide balance to the local economy from a land-intensive, extraction-based activities like agriculture to activities that are non-consumptive and tend to promote conservation of forest areas, better management of water resources, and a reduction in overall environmental impacts. Furthermore, as the sector grows in importance, it can be expected that groups and individuals depend on the sector would become more vocal advocates for good stewardship of the natural resources upon which their livelihoods depend. This will require close coordination and cooperation with

indigenous peoples and their management areas as well as a strong relationship with SERNAP in the development and management of public use areas in protected areas.

7.2 Potential Direct Negative Impacts of the Preferred Alternative

Among the major direct impacts that may result from tourism investment under the Preferred Alternative are the local clearing of native vegetation and the inadequate disposal of site-related wastes used in the renovation of tourist facilities, including associated infrastructure (sewer systems, solid waste disposal facilities, extension of the power lines). Additional construction in the form of tourism-induced improvements of municipal services and construction of employee housing and facilities could have similar impacts.

Secondly, major direct impacts can be anticipated with the construction of poorly planned trails for tourist access around hotels, restaurants, recreational and protected areas. The more obvious problems are associated with increased local erosion and the possibility that new access points would facilitate the colonization of adjacent protected areas and indigenous lands, absent improved control and enforcement. This risk calls attention to the need to improve planning of tourism facilities and strengthen the capacity of SERNAP and indigenous groups to protect the lands under their jurisdiction.

Third on the list of potential negative impacts is the improper management of operational, sanitary and hazardous wastes. These include household wastes, oils, solvents, paints, fuels, and sewerage. Improper management of these substances can result in the local contamination of waterways, soils and air. On the other hand, a grants program that promotes an environmental management systems approach to the operation of tourism facilities would mitigate these risks, if not improve the current situation.

Finally, increased resource consumption of power, water, and food are often associated with the arrival of tourist clientele. Tourists typically place increased demands on local supply systems as they expect higher levels of service and service quality. While this often results in improvements to the community in service quality, the loss of resources to the tourism sector can reduce the availability of some resources to the local community. Additionally, immigrant workers servicing the industry place additional demands on local systems. Without adequate planning and community participation, these can actually lower community standards of living by increasing competition for scarce resources.

7.3 Cumulative Negative Impacts

Cumulative impacts result from the incremental effect of direct and indirect impacts. These effects tend to build on one another and can be insidious in nature. Waste disposal, land use and development trends, disturbances to sensitive animal and plant species can all produce lasting impacts. Other negative cumulative impacts of tourism could be increased settlement from migrant employees, increases in petty theft or drug traffic, and increases in cost of living as tourists begin to affect regional pricing strategies.

Positive cumulative impacts are also often produced such as increased living standards, improved literacy, and decreased infant mortality from improved access to healthcare. While tourism development does not necessarily contribute directly to these positive things, the demand

for educated workers, shared economic improvements, improvements to water quality will likely result from successful tourism development.

Rather it is the negative cumulative impacts of other economic activities on the tourism sector that is most worrisome. Gradual declines in river water quality, changes in the local fishery, loss of wild food sources are all the result of colonization and associated land clearing for agriculture. These have already begun to affect the tourism potential for the region as “pristine” sites are despoiled.

7.4 Comparison of Alternatives

As a preliminary screening tool, the anticipated impacts associated with the various alternatives are presented in Table 7.1. These impacts relate to the general categories of environmental effects that might be associated with the various alternatives considered. Alternatives 3, 4 and 5 relate to the various levels of investment in infrastructure but share a common denominator: no new lodging capacity would be built with support of USAID funds. Infrastructure is limited to upgrading or repair of hotel infrastructure and development of trails, interpretative kiosks, nature centers and other itinerary-based activities. Alternatives 3 and 4 leave open the possibility of establishing campgrounds and other rustic services for visitors. Alternative 3 is the Preferred Alternative.

Table 7.1 Macro Impacts for Alternatives Considered

Environment affected	Activity	Potential Impacts	Potential Consequences	Alternatives				
				1	2	3	4	5
Socioeconomic	New construction adds room space to regional inventor	Increased room space further dilutes regional room inventory	Prices per room fall further. Loss of revenue results in deterioration of facilities, loss of employment, loss of destination reputation	Medium	High	Low	Low	Low
Socioeconomic	Investments made in tourism sector without adequate sector planning	Spontaneous development of region with reduction of quality in cultural and natural resources	Poor reputation of Chapare as tourism destination resulting in further loss of national and international tourism appeal	High	Low	Low	Low	Low
Socioeconomic	Tourism activities developed without local participation	Social exclusion and inequitable distribution of market share	Aggravation of local political and social elements resulting in increased hostilities among regional participants	High	Low	Low	Low	Low
Socioeconomic	Tourism investment program conducted without participation of local government	Development that is inconsistent with local land use and development plans	Reduction in quality of life for local populations and reduced appeal for national and international tourists. Strain on local government resources	High	Medium	Low	Low	Low
Socioeconomic	Local cultural and social values not integrated in sector investment activities	Damage to local cultural identity, reduction in quality of a valuable tourism resource	Erosion of local tourism appeal resulting	High	Medium	Medium	Medium	Medium
Biological	Increased tourism results in further strains on forest and river food resources	Hunting and fishing activities hyper stimulated (with respect to available resources)	Loss of natural wildlife populations and food source for indigenous peoples. Loss of fishing industry	High	High	Medium	Medium	Medium
Socioeconomic	Trails and road construction induces colonization without adequate control	Nature trails and access roads serve as corridors for colonization	Protected lands destroyed by colonists due to lack of protection	High	Medium	Medium	Medium	Medium
Physical	Land destabilized by uninformed construction practices and siting of tourism facilities	Landslides, erosion and loss of habitat	Permanent loss of land and development of potentially life threatening slide zones. Contribution to soil erosion and stream sedimentation	High	Medium	Low	Low	Low
Physical	Demand on water resources outstrips supply	Potable water supply contaminated or availability reduced for lack of adequate supply	Reduction in public water availability and loss of water quality forcing on site treatment	High	Medium	Low	Low	Low
Physical	Poor waste management and sanitary treatment practices increased regional pollution	Increased pollution and loss of recreational/natural resources to public use	Waters become unusable, disease spreads, vectors propagated	High	Medium	Low	Low	Low
Biological	Increased tourism demand degrades local habitats, extirpates sensitive species	Over use of resources results in degradation or loss of populations and habitats	Loss of wildlife populations, indigenous peoples denied native food source	High	Medium	Low	Low	Low
Biological	Sport hunting and fishing deplete local resources and adversely affect commercial activities	Increased in consumptive recreational activity competes with strained resources absent active management	Sportsmen seen as competition even though their contribution to resource loss is minimal compared to other regional activities	High	Medium	Low	Low	Low
Multiple	Regional investment occurs without coordination with other USAID CONCADE activities	Incompatible development negatively affects regional market image and quality of resources	Cumulative impacts increase pollution and habitat loss for the region making the area less appealing to tourism	High	High	Medium	Medium	Medium
Multiple	Regional investment occurs without coordination with other donor activities	Duplication of effort and cross purpose development results in loss of regional character and effective vision	Cumulative impacts increase pollution and habitat loss for the region making the area less appealing to tourism	High	High	Medium	Medium	Medium
Physical/ Biological	Nature-based tourism activities developed without participation	Public lands degrade. Land management plans incompatible	Cumulative impacts increase pollution and habitat loss for the region making the area	High	High	Medium	Medium	Medium

Environment affected	Activity	Potential Impacts	Potential Consequences	Alternatives				
				1	2	3	4	5
	of public land managers	with public use elements	less appealing to tourism					
Socio-economic	Activities developed without adequate safety and security planning	Patrons injured, region develops reputation as unsafe	Regional reputation damaged resulting in loss of tourism revenue. Serious consequences to injured patrons	High	High	Medium	Medium	Medium
Multiple	Induced colonization by potential migrant workers further degrades local natural lands	Protected lands invaded, lack of services results in improper disposal of waste and sewerage	Loss of habitat and wildlife populations. Increase in pollution and disease	High	Medium	Low	Low	Low
Socio-economic	Regional resources developed without adequate protections in place	Colonization induced along nature trails due to improved access. Loss of features due to poor design and planning	Further erosion of local habitats. Increased pressure on food source wildlife species. Loss of protected area. Invasion of TCOs	High	Medium	Low	Low	Low
Physical/ Biological	Poorly planned trails and nature based activity areas quickly degrade	Erosion and physical damage renders trail useless.	Loss of attraction. Experience degraded, affecting regional reputation. Loss of tourism resource	High	Medium	Medium	Medium	Medium
Physical/ Biological	Demand for high visibility activities degrades resources, degrades the experience	Damage and over crowding damages attraction	Loss of attraction. Experience degraded, affecting regional reputation. Loss of tourism resource	High	Medium	Medium	Medium	Medium
Socio-economic	Untrained, unqualified guides injure clients damaging regional reputation	Poorly trained guides cause accidents injuring clients	Regional reputation damaged resulting in loss of tourism revenue. Serious consequences to injured patrons	High	Medium	Medium	Medium	Medium
Socio-economic	Poor construction practices injure patrons	Patrons injured from electrical, structural flaws, etc.	Regional reputation damaged resulting in loss of tourism revenue. Serious consequences to injured patrons	High	Medium	Low	Low	Low
Socio-economic	Disease disrupts tourism economy	Contaminated water, insect vectors, sick employees infect patrons	Regional reputation damaged resulting in loss of tourism revenue. Serious consequences to injured patrons	Medium	Medium	Low	Low	Low
Multiple	Non-tourism activities disrupt tourism resources, degrade attractions through pollution and resource consumption	Pollution form agriculture, loss of watershed from timber harvest, induced colonization from improved road access degrade regions appeal.	Regions resources degraded or destroyed. Erosion and water contamination increase. Allied industry lost	High	High	High	High	High

In the opinion of the PEA Team, tourism support to the tourism sector under the Preferred Alternative will not be a major contributor to regional environmental degradation while potentially making a significant contribution to the regional economy. Support for tourism development under Alternative 3 would be accompanied by support for introducing environmental management concepts and other training in planning and monitoring. Compared to the "No Action Alternative," the addition of a solid planning, review, training and monitoring framework serves to mitigate at a reasonable cost many of the negative consequences associated with the unorganized tourism development currently undertaken in the Chapare. Some areas already show the signs of:

- Soil erosion from damage to watersheds and poorly designed roads and trails
- Poorly planned infrastructure and excessive use in areas such as camp sites and tour routes
- Deterioration of local water resources and quality due to the discharge of untreated wastes
- Inappropriate design and location of latrines, septic tanks, and solid waste
- Destruction of unique flora and fauna to cater tourism demands

It is also clear that other development activities, especially agriculture, are seriously affecting the character of the region and have resulted in increased runoff to streams, contributed to degradation in regional water quality, induced colonization and opened access to regional resources. These activities are directly affecting the environmental quality of the region and its tourism potential. For this reason, regional planning and integration of environmental management across economic sectors is critical.

There is a driving need for development of new and improved tourism activities, itineraries and destinations to unlock the region's interesting natural attributes. Alternative 3 opens the possibility for these types of investment. This strategy, combined with upgrading small- and medium-scale facilities, would enhance the nature-based tourism experience of clients and, subsequently the reputation of the Chapare as a tourism destination of choice without artificially stimulating growth or competition in an already stressed market with unused capacity.

7.3 Mitigation of Impacts

While numerous potential impacts have been identified in association with tourism activity, the actual environmental impacts of tourism are comparatively modest. From the perspective of habitat protection and alternative use, tourism is non-consumptive and promotes an alternative to resource conversion. The economics of tourism however can be unforgiving in that much of the demand is developed based on client attitude and perception. Also, national and international events can greatly affect the markets over long- and short-term periods. Finally, perception is key to the viability of a given tourism market. Safety, civil unrest, environmental quality all help determine the suitability of a particular destination.

Table 7.2 Initial Costs of Mitigation Measures

Mitigations	Initial Costs
Let market forces dictate new construction, no investment by USAID	None
Develop strategic approach to tourism funding within USAID/CONCADE grants program.	Estimated cost of strategic plan US$5,000 (drawing on existing/prior tourism studies)
Establish standing workgroups of government and private sector participants	Minimal; part of routine operations
Coordinate with local governments and ensure their participation in regional planning efforts sponsored by USAID	Meetings and travel US$10,000
Place strong emphasis on cultural development in planning studies and assure cultural representatives have role in development processes	US$5,000 administrative costs and travel support
Coordination with wildlife management agencies, improved education. Incentives for restaurants to offer domestic meats in lieu of forest meats	US$5,500 for training and educational support
Carefully screen all activities which may result in opening lands. Do not support any activity which can not be adequately protected. Make sure each project receiving grant funding coordinates with municipalities and/or SERNAP, to assure enforcement capabilities within the municipality	US$20,000 for meetings and administration and training to hold interagency summit on protected land management issues
Use development guidance manual to review projects. Work with local jurisdictions to develop approval and inspection capabilities in zoning and construction.	None
Use development guidance manual to review projects. Work with local jurisdictions to develop a water baseline for the region and identify critical resources.	Develop a status assessment of water supply and identify important watershed areas to protect this supply US$15,000 for assessment and training materials
Work with local representative, indigenous peoples and facility owners to develop waste management systems Use development guidance manual to review projects. Work with local jurisdictions to develop approval and inspection capabilities in zoning and construction.	Workshops and meetings with regional representatives, coordination with other donor agencies to maximize effect US$10,000 for meetings and materials
Work with local officials, SERNAP, cooperatives and restaurants to reduce commercial use of wild meats in commerce. Develop cooperative education programs together with local representatives and SERNAP to target hotel and restaurant owners	Develop distribution materials together with SERNAP and workshops, US$10,000
Develop cooperative education programs together with local representatives and SERNAP to target hotel and restaurant owners who serve forest meats. Assess local resource capacity and assist with the development of a resource management plan	Work with local authorities and SERNAP to develop fish and game management plans for the region US$10,000 for travel and management plan support Educate tour operators and guides
Use development guidance manual to review projects. Work with local jurisdictions to develop approval and inspection	US$35,000 for materials, administration, workshops and coordinating activities

Mitigations	Initial Costs
capabilities in zoning and construction. Enforce the environmental strategies contained in the other PEAs completed for CONCADE. Develop regional environmental working group and hold workshops to improve environmental management and coordination for the region.	Consider an independent environmental review body to manage environmental requirements for all CONCADE activities Establish an interagency-inter government work group or regional oversight group to manage environmental planning
Use development guidance manual to review projects. Work with local jurisdictions to develop approval and inspection capabilities in zoning and construction. Develop regional environmental working group and hold workshops to improve environmental management and coordination for the region.	US$10,000 for materials, administration, workshops and coordinating activities. Add to CONCADE coordinating effort
Use development guidance manual to review projects. Work with local jurisdictions to develop approval and inspection capabilities in zoning and construction. Coordinate with TCOs and SERNAP	US$10,000 for meetings, materials, workshops and administration of coordination efforts
Use development guidance manual to review projects. Work with local jurisdictions to develop security plans and enforcement priorities. Assist with regional emergency management planning.	Assist municipalities with developing safety and security plans, identify regional resources US$10,000 meetings, training sessions, materials and administrative support Couple effort with ongoing assistance programs
Use development guidance manual to review projects. Work with local jurisdictions to develop approval and inspection capabilities in zoning and construction. Work with hotel owners to provide quarters for workers.	Include theme in regional workshops and training materials
Use development guidance manual to review projects. Work with local jurisdictions to develop approval and inspection capabilities in zoning and construction. Work with SERNAP to devise strategies for protecting park resources. Involve leadership of TCOs.	Identify crosscutting links where national police or other body can improve vigilance in park areas. Assure that no project is developed without adequate supervision and enforcement to stop colonization US$15,000, meetings, administration, and materials
Use development guidance manual to review projects. Work with local jurisdictions to develop approval and inspection capabilities in zoning and construction.	Coordinate planning with appropriate agency US$5,000 in travel, meetings, technical assistance. Coupled with other ongoing programs
Use development guidance manual to review projects. Work with local jurisdictions to develop approval and inspection capabilities in zoning and construction. Identify limits of acceptable change.	Coordinate planning with appropriate agency US$5,000 in travel, meetings, technical assistance. Coupled with other ongoing programs
Use development guidance manual to review projects. Work with local jurisdictions to develop training program for various types of guides.	Assist municipalities with developing inspection standards and procedures to ensure quality is high for the region US$25,000 meetings, training sessions, materials and administrative support
Use development guidance manual to review projects. Work with local jurisdictions to develop approval and inspection capabilities in zoning and construction.	Assist municipalities with developing inspection standards and procedures to ensure quality is high for the region US$25,000 meetings, training sessions, materials

Mitigations	Initial Costs
	and administrative support
Use development guidance manual to review projects. Work with local jurisdictions to develop approval and inspection capabilities in zoning. Participate or develop land-use planning programs	US$20,000 meetings, training sessions, materials and administrative support
Use development guidance manual to review projects. Work with local jurisdictions to develop approval and inspection capabilities in zoning. Educate service providers in public health requirements. Work with municipalities to establish inspection programs.	US$20,000 Meetings, training sessions, materials and administrative support Coordinate with other ongoing activities
Use development guidance manual to review projects. Work with local jurisdictions to develop approval and inspection capabilities in zoning and construction. Develop regional environmental working group and hold workshops to improve environmental management and coordination for the region.	US$30,000 for materials, administration, workshops and coordinating activities. Add to CONCADE coordinating effort Consider separate environmental management program for regional activities

7.4 Mitigation Measures (MM) for Tourism Grants

A set of straightforward mitigation measures is proposed for the Preferred Alternative. Since the PEA does not address specific action/sites, the recommended measures broadly address four categories or areas: i) Proposal preparation and review; ii) Monitoring; iii) Training; and iv) Complementary actions. The approach is to encourage good environmental management and monitoring through the grant process by stakeholders and the grant manager while supporting a limited number of activities to strengthen regional planning and institutional capacity to guide development of the sector.

7.4.1 Grant preparation, review and approval procedures

MM1: Support of the tourism sector through the CONCADE grant program should be guided by a clear strategy and vision as to the desired end results, avoid undesirable site-specific and cumulative consequences and maximize positive impacts.

- Responsible party: CFH with USAID AD SOT
- Estimated cost: $5,000: part of routine grant management operations.

MM 2: The TOR for proposal preparation will include a clear definition of the scope of eligible activities under the Preferred Alternative, an environmental checklist for the proposed activity drawn from the guideline for tourism development in the Cochabamba Tropics that supplement the present PEA, and requirements for compliance with Bolivian environmental law. Specific guidance will be provided for investments near or in protected areas and TCOs.

- Responsible party: CFH with C-23 and USAID-REA assistance
- Estimated cost: Negligible: part of routine grant management operations.

MM 3: Grant proposals will clearly demonstrate compliance with Bolivian environmental law and adequate information based on completion of the above environmental checklist. In the case of protected areas and TCO, grantees and implementing parties must obtain formal approval by

the appropriate level of authority responsible for management of these lands as part of their grant application (SERNAP, CPITCO).

- Responsible party: Grantees and implementing parties with assistance from CHF, as needed
- Estimated cost: Dependent on scale of proposed activity, but should be minimal for the scale of most projects eligible under the Preferred Alternative (< $500).

MM 4: Environmental criteria, social impacts, and equity issues will be incorporated into and given equal weight in the overall grant evaluation process. All proposals must fall within the scope of tourism development activities approved under the Preferred Alternative, demonstrate how environmental impacts will be mitigated, and assure that adequate resources are allocated to do so.

Uncertain cases will be deferred to Project C-23 and the USAID REA for review to determine the need for additional information and/or preparation of a separate IEE or EA, as appropriate under USAID environmental regulations

- Responsible party: CHF with assistance from Project C-23 and the USAID REA.
- Estimated cost: Negligible; part of routine operations

MM 5: Approved grant agreements will include specific environmental measures and conditions, as needed, based on the attached guidelines. Environmental criteria will be made part of overall project monitoring and reporting.

- Responsible party: CHF and grantees
- Estimated cost: Negligible; part of routine operations

MM 6: Where feasible and appropriate, priority should be given to investments that foster community involvement and generate clear and significant benefits for community members, especially in TCOs and other economically isolated and marginalized communities.

- Responsible party: CHF
- Estimated cost: Negligible; part of routine operations

MM 7: Through grants to individual operators and associations, special attention will be made to identify ways for promoting greater awareness of tourism opportunities in the region.

- Responsible party: Grantees and implementing parities; CHF
- Estimated cost: Negligible; part of routine operations

7.4.2 Reporting and monitoring

MM 8: Progress in implementing agreed measures and conditions or how unanticipated impacts are being mitigated will be an integral part of routine project reporting by the grantee or implementing party.

- Responsible party: CHF, grantees or other implementing parties
- Estimated cost: Negligible; part of routine grant implementation

MM 9: Corrective actions, as needed, will be taken in a timely matter by the grantee or implementing party as a condition for continued support under the grant.

- Responsible party: Grantees or other implementing parties; CHF
- Estimated cost: Variable; project-specific

MM 10: Environmental criteria as outlined in the guidelines and grant agreements will be applied during routine site visits.

- Responsible party: CHF
- Estimated cost: Negligible; part of routine operations

MM 11: As part of its environmental oversight responsibilities in the CONCADE project, the Environmental Unit of C-23 project will carry out periodic site visits of approved grants and collaborate with CHF in working with grantees and implementing parties to assure that corrective actions are taken.

- Responsible party: Project C-23
- Estimated cost: National consultant; 8 person-weeks per year plus mobilization; approximately $8,000/year.

MM 12: A brief report on compliance with mitigation measures under the present PEA will be included in quarterly progress reports and an annual report to the Alternative Development SOT. The annual report shall be prepared at the end of the calendar year for approval by the MEO.

- Responsible party: CHF and Project C-23
- Estimated cost: Negligible; part of routine operations

MM 13: The Environmental Guidelines that are annexed to this PEA will be edited, translated and distributed to municipal authorities, tourism operators, TCO authorities, prospective grantees and other interested parties. Workshops will be held to present and discuss the Guidelines.

- Responsible party: CHF with collaboration with Project C-23
- Estimated cost: 200 copies in Spanish; 10 half-day workshops: $25,000

7.4.3 Training

MM 14: Continuous training will be provided to CHF personnel responsible for grant management in:

- USAID environmental procedures (22 CFR 216) and Bolivian environmental law (Law 1333)
- Principal environmental concerns associated with proposed investments under the grant program generally and tourism specifically.

- Specific procedures and measures approved under the EAs, SEA and PEAs approved for CONCADE.
- Environmental Management System approaches to continuously improve the competitiveness and environmental quality of grantee operations.
- Responsible party: Project C-23 in coordination with CTPS, Dirección de Recursos Naturales, others as appropriate.
- Estimated cost: 20–30 hours/person annually; $10,000/year.

MM 15: Training will be provided to grantees and implementing parties in:

- Compliance with approved environmental measures and conditions under grant agreements (mandatory).
- Introduction to Environmental Management System approaches to continuously improve the competitiveness and environmental quality of grantee operations (mandatory)*.
- Preparation of Environmental Management Plan for their operations (optional; according to demand and interest).
- Responsible party: CHF and Project C-23 in coordination with Center for the Promotion of Sustainable Technologies Program (CPTS), Chamber of Hotel Operators, Dirección de Recursos Naturales, others as appropriate.
- Estimated cost: Minimum 4 hours training for each grantee before award of grant; additional optional training 8–16 hours/grantees for preparation of Environmental Management Plan; $15,000/year.

* A simple EMS can be a first step toward internationally recognized environmental certification (ISO 14000, Green Globe 21.). As the business environment for tourism evolves in the Chapare, a fuller program toward certification of tourism operators could be considered.

7.4.4 Complementary measures

MM 16: Municipalities in the CONCADE project area will be provided assistance in developing zoning and construction standards for related-tourism infrastructure to better assure the safety of visitors, avoid environmental impacts, and protect the aesthetic quality and reputation of the region for tourism.

- Responsible party: Project C-23 in coordination with PRAEDAC Municipal Strengthening, Prefecture of Cochabamba, others as appropriate.
- Estimated cost: 20 hours of training for 20 people; national short-term consultancy; $10,000.

MM 17: SERNAP and TCO authorities will be consulted in the design, implementation and operation of all tourism investments under CONCADE that might affect lands under their jurisdiction. Grantees and implementing parties must obtain formal approval by the appropriate level of authority before grants can be approved.

- Responsible party: Grantees and CHF
- Estimated cost: Negligible; part of routine operations

MM 18: Assistance will be provided to SERNAP and TCOs in development of tourism development plans as part of ongoing resource planning initiatives within areas under their respective jurisdictions. This will be done using information and data readily available from past studies.

- Responsible party: Project C-23 in coordination with PRAEDAC, SERNAP, CPITCO
- Estimate cost: National short term consultancies; 6 person-months; $ 20,000.

MM 19: Efforts should be made to reactivate the region-wide environmental planning committee created in 2000 under the leadership of the Dirección de Recursos Naturales, Prefecture de Cochabamba to assure coordination in land-use planning, implementation of Bolivian natural resource and environmental regulations, and assessment of cumulative impacts to the region's environmental that might prejudice development of the tourism sector. In lieu of working with the Prefecture, a similar effort could be made through the Cochabamba Tropics Mancomunidad.

- Responsible party: Cochabamba Prefecture, Project C-23, DAI, and other members.
- Estimated cost: Negligible; part of routine operations.

MM 20: Greater engagement with and support to the Chamber of Hotel Operators in the Cochabamba Tropics will be encouraged to discuss how this important interest group could be a more effect advocacy group for conservation of the region's natural attractions, broaden its membership to include community-based operators and encourage measures by its members, either collectively or individually, to improve the quality of the nature-based tourism experience of their clients (code of conduct, safety, EMS, protection of important natural attractions).

- Responsible party: CHF, Chamber of Hotel Operators, others as appropriate.
- Estimated cost: Seminars, meeting, site visits, $20,000.

7.5 Management of Potential Social Impacts of Investments in Tourism in the Chapare – Principles for Considerations

Potential investments for the development of tourism in the Chapare region should take into consideration the need to manage the effects of those investments on the surrounding landscape and local population. Accordingly, the grants administrator, CHF, should incorporate into its grants selection criteria social aspects and concerns raised during public consultations and stakeholder analysis (see Annex 7). In this vein, the following principals are recommended for integration into the selection criteria:

1. Tourism developments must consider long-term sustainability by creating mechanisms for participation and consultation of all stakeholders (businesspeople, indigenous peoples, settlers, merchants, and so forth) and institutional actors (municipios, prefecture, NGOs, project) in the development of a long-term tourism plan. As such, grant proposals which demonstrate a true effort to "fit in" with local development goals and long-term plans should be given preference.

2. A framework is needed for coordinated territorial organization and planning that guides, governs, and promotes sustainable tourism that is socially equitable, environmentally sound,

and economically viable. The first steps toward such a framework may be taken under the CHF program, as criteria for evaluating grant proposals should consider whether the grantee has performed any kind of preliminary self-evaluation to determine how it might address social, environmental and economic concerns.

3. Investments should generate greater ripple effects through the local economy. Whenever possible, grantees should procure goods and services locally, hire of locally based personnel, and consider how the proposed investment will contribute to promoting additional investment in the sector.

4. Visitor comfort and safety should also be taken into account when evaluating grant proposals.

5. Investment in community-based tourism projects in indigenous territories and economically marginalized settlements is recommended. This is in keeping with the broader alternative development objective of creating licit economic alternatives to coca production. In these communities, nature-based tourism may often be a viable alternative as a complement other activities. In such cases, equitable distribution of benefits will be an important issue that should be considered in grant proposals.

6. Public-private partnerships should be supported. Investments aimed at the creation of community-based tourism through partnerships with private operators should be fostered. Again, under such arrangements broad participation leading to an equitable distribution of benefits will be a key concern.

7. As noted in Mitigation Measure No. 11, opportunities should be sought to strengthen the capacity of municipalities to plan and deliver services that support the tourism sector such as basic sanitation and water and apply regulations to protect highly visible landscapes, infrastructure siting and construction codes, etc.

8. The local Chamber of Hotel Operators should encourage the adoption of a code of conduct for clients and tourism operators to prevent undesirable social, cultural, and environmental effects. The grant program should incorporate, whenever possible, educational activities for the tourists, operators, and the community on matters involving social, cultural, and environmental interaction and interpretation.

9. Investments in tourism infrastructure and facilities should make every effort to use locally available materials and should follow design patterns in harmony with the natural surroundings. Landscaping should contemplate the use of local flora, and should demonstrate a preference for ornamental plants whose upkeep will fit with the local climate, thereby requiring little if any additional maintenance (such as watering, fertilization, pest control).

8. Environmental Monitoring and Evaluation

USAID Environmental Regulations require the preparation of a monitoring plan for all programs and projects for which an environmental assessment and mitigation plans have been prepared. This is necessary in order to ensure the implementation of mitigation measures and recommendations developed during the study.

The primary objectives of this monitoring plan are:

- To ensure the proper implementation of the environmental guidelines and mitigation measures developed for the proposed tourism activities;
- To ensure adherence to the engineering design for the construction/renovation of tourism or tourism-related facilities;
- To develop the roles and responsibilities for the monitoring team in charge of environmental compliance;
- To outline the roles and responsibilities of all parties involved in the approval and project implementation process, including USAID, NGOs, contractors, municipalities, GOB entities and others;
- To establish a set of steps or procedures for compliance with the monitoring plan.

The monitoring plan to be used for this program will be based on a mitigation-monitoring model. It is be designed to determine the suitability and effectiveness of the mitigation plans developed for the program. Thus negative environmental impacts can be minimized or compensated for during activity implementation. Aspects of this plan have been incorporated into the mitigation measures defined above.

8.1 Monitoring Responsibilities

All USAID-funded tourism activities subject to mitigation measures should be continuously monitored for compliance, suitability, and effectiveness.

CHF should hold primary responsibility for the monitoring and evaluation of projects supported by grants disbursed through its grant program. Under the current grant program, CHF will have primary responsibility for the gathering and assessment of the information generated from the monitoring activities and for the implementation of the follow-up actions. CHF will likewise be responsible for its overall review, analysis and dissemination of information regarding the progress of grants, the process of grant disbursements, and reporting on the measures taken to ensure that environmental mitigation is implemented and monitored.

C-23 will have primary responsibility for providing as needed support to CHF monitoring and evaluation activities. In keeping with C-23's longstanding involvement in environmental oversight of CONCADE activities. As stated above, C-23 might be called in to review grant proposals which contemplate larger investments in tourism and which as a result might imply larger environmental impacts generated by the resulting project. C-23 may also be called upon to provide recommendations as to mitigation measures which could be incorporated into successful grant proposals.

USAID's Mission Environmental Office (MEO) or REA should take an interest in periodic review of grants disbursed through the CHF program and should make recommendations as to the remediation and enforcement of recommended actions identified through monitoring activities. It will also be USAID's responsibility to ensure that the CHF program (and other grant-disbursement programs) have the funds necessary to ensure the sustainability of the monitoring activities throughout the program and implement approved mitigation measures.

8.2 Monitoring Techniques

All activities with the potential for adverse environmental impacts and implemented through this tourism funding program should be accompanied by mitigation plans generated by applying the appropriate environmental guidelines found in the PEA. The guidelines will identify potential impacts and the mitigation measures to be taken to reduce or eliminate each impact. The environmental guidelines and mitigation plan generated as part of the EA should be integrated into the monitoring plan for that particular project or activity. The identified negative environmental impacts and associated recommended mitigation measures should become the parameters to be monitored.

The monitoring process will be relatively simple to execute but must be performed by personnel with adequate education and experienced in infrastructure construction quality control and in environmental mitigation and monitoring. It is also important to note that a mitigation plan cannot become the basis of a monitoring plan unless the implementing entity is contractually obligated to execute the mitigation plan. Therefore, *it is critical for CHF to include the mitigation plan as an amendment to each contract, cooperative agreement, or other any other mechanism used to implement reconstruction activities*. If the mitigation plan is not part of the contract, there is no legal obligation for the implementing entity to execute the mitigation plan, nor is there any mandate for a third party to monitor the implementing entity's execution of the mitigation plan.

To increase the effectiveness of the monitoring plan, USAID should conduct a yearly review of the system to allow for the introduction of new environmental performance measures, which should be integrated as much as possible with the existing performance monitoring systems.

Support to the tourism sector should build on the Environmental Management Systems approach already in the Chapare. The aim is encourage voluntary actions on the part of operators to continually improve effective and efficient environmental management of their operations. Implementing partners (grantees, CHF personnel, C-23 personnel) will be required to attend training in EMS by the Center for the Promotion of Sustainable Technologies Program (CPTS).

9. List of Preparers

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Mr. Meier is a biologist with more than 25 years of international experience in environmental management and analysis. As an international consultant, he has performed numerous studies and managed projects relating to national and international environmental management, institutional development and environmental program design. He has conducted studies for international clients including UNDP, World Bank, Inter-American Development Bank, USAID, and others in Central and South America, the Caribbean, Africa and North America.

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Mr. Michaels is a natural resource economist with more than 15 years of experience conducting economic analyses of environmental and natural resource issues. He has extensive technical experience in economic assessments of environment and development problems and studies of the economic and financial feasibility of environment and development projects. He has completed international technical assignments in Panama, the Dominican Republic, Bolivia, Costa Rica, Honduras, Peru, Paraguay, El Salvador, and Nicaragua, among others.

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Mr. Cox is a consulting sociologist with more than 20 years of experience dealing with the native peoples of Bolivia. He is the former director of the Rural Development and Capacity building program for the National Secretariat for Rural Development and under the UN Global Environmental Fund (GEF) and was the national coordinator for the small donors fund for the environment. He has authored studies and specializes in social development of indigenous peoples.

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Mr. Padilla is an environmental specialist with extensive experience in environmental impact studies in Bolivia. He has participated in other environmental impact assessments related to the construction of the national highway system and its impact on local ecosystems and communities. He teaches environmental engineering and environmental impact assessment at the Universidad Mayor de San Simón in Cochabamba, Bolivia.

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Mr. Crespo is an environmental engineer with 19 years of experience working in Bolivia, Chile, and Peru. He provided professional services in environmental studies, audits, and evaluations, and holds expertise in federal, departmental, and municipal governments and the private sector. Mr. Crespo supervised and managed construction and industrial projects with a focus of iron and wood products.

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ANNEX 1

Environmental Assessment, USAID/Bolivia, Special Objective: Elimination of Illicit Coca from the Chapare

ANNEX 2

Supplementary Environmental Assessment: Alternative Development Efforts in the Tropics of Cochabamba

ANNEX 3

Supplemental Environmental Assessment of Livestock, Pasture and Silvopastoral Management in the Chapare

ACRONYMS

AD – AlternativeDevelopment

BUM – *Bosque de Uso Multiple*, Multiple Use Forest

BMP – Best Management Practices

C-23 – UN/FAO Agroforestry Program, CONCADE executing organization

CISTEL – *Centro de Investigación y de Servicios en Teledectección*

CONCADE – Counter Narcotics Consolidation of Alternative Development Efforts

DAI – Development Alternatives International

EA – Environmental Assessment

GOB – Government of Bolivia

NGO – Non-governmental Organization

PDAR – *Programa de Desarrollo Alternativo Regional*

SEA – Supplemental Environmental Assessment

SERNAP – *Servicio Nacional de Areas Protegidas*

TC – Tropics of Cochabamba

USAID – United States Agency for International Development

EXECUTIVE SUMMARY

In 2001, a Supplemental Environmental Assessment (SEA) was conducted for Alternative Development efforts in the Tropics of Cochabamba. (Kernan, 2001.) Alternative Development (AD) is an initiative guided by the USAID Special Objective "Illegal coca eliminated from the Chapare". AD aims to provide farmers who have left coca cultivation with production alternatives and to establish a licit, sustainable economy in the Chapare of Cochabamba. The 2001 SEA was the consequence of a preceding Environmental Assessment (Kernan, 1998) and a Positive Determination from the 2000 Threshold Decision. One of the results of the 2001 SEA was the requirement of the implementation of a Supplementary Environmental Assessment for CONCADE'S proposed livestock promotion activities. Kernan (2001) recognizes the possible benefits of promoting silvopastoral livestock management systems in the Chapare – to stabilize and intensify land uses, increase family incomes, improve soil fertility, maintain biodiversity and improve microclimates. This SEA also responds directly to sections 118 and 119 of the U.S. Foreign Assistance Act (FAA).

The EA Team collected data from field visits, scoping meetings, literature review, GIS analysis and key informant interviews, based on the guidance from original Scope of Work (SOW) objectives. The composition of the EA Team is included in Appendix C.

Project Background: The proposed livestock promotion activities respond to the growing meat and dairy production activities in the Chapare. Currently, over 3,300 families are raising 62,135[1] head of cattle on 29,187 hectares of pastureland. Livestock management, pasture management and land conversion practices for ranching activities have motivated the CONCADE project to develop silvopastoral systems to improve cattle production while also improving environmental conditions. Since 2001, CONCADE has carried out silvopastoral interventions on 187 farms within the Chapare. These activities range from planting live fences to constructing corrals and water systems. One of the activities that the "Silvopastoral Experiment" phase of the proposed activities implemented was the introduction of improved breeds of cattle into a select group of farms with the purpose of improving the genetic stock, thereby improving production and resistance to disease in herds.

Affected Environment: With annual precipitation rates ranging from 2,700-5,000 millimeters, water plays an important and often limiting role in the development of this region. Consequently, soil compaction and erosion are consistent issues for local land users. Lands that have been converted from forests to pasture show a higher propensity to compaction and erosion, especially under current rangeland management practices.

According to satellite images from 1990 and 2000, primary forest cover within the BUM has decreased 20% over the past ten years. It is estimated that 10,000 – 15,000 hectares of forest were burned per year prior to 1997. However, deforestation rates seem to be decreasing (Minnick, personal communication, 2003). Currently, 60% of the Chapare is forested with 40% primary and 20% secondary forest.

[1] From DAI *Encuesta Agropecuario (2002)*, these data vary by the 1,000's between different data sources.

Although a biodiversity survey has not been completed for the Multiple Use Forest zone, wildlife data from neighboring Carrasco National Park and regional reports on the Tropics of Bolivia illuminate the importance of the Chapare as habitat for endemic, threatened, and endangered species. The Chapare acts as an economic corridor between Santa Cruz and the highlands of Cochabamba. Its roads and settlement patterns act as a barrier to wildlife migration and movement between the large protected areas to the north and to the south.

Of the 550,000 hectares that make up the BUM, 32,500 are considered pasturelands. It is uncertain what percentage of pasturelands is severely degraded, but according to DAI (2003) agricultural census data, 62,135 head are grazing 29,187 hectares. This infers a current stocking rate of 2.1head/hectare, with an estimated carrying capacity of 2.0 head/hectare depending on actual site conditions.

According to recent CONCADE research, 81% of farmers raise cattle for both milk and meat. Recent economic studies show that 87% of the silvopastoral farms were profitable - they experienced greater than 12% rate of return on the investment projected over a five-year period. On a daily basis, dairy farmers currently produce on an average of four liters/day, earning approximately $5.00 per day on milk production.

Currently, 178,769 people live in the five municipalities that comprise the Chapare region. (Censo Nacional, 2001.) Recent social surveys document the colonist nature of the population and this region. (Proyecto CONCADE, 2001.) The western region, around Villa Tunari, has experienced a 1.16% population increase between 1992 –2001. The Chimore and Puerto Villaroel regions have experienced a 6.3% and 5.0% growth during this same time period, respectively.

On a national level, much of Bolivia's environment and natural resources regulatory agencies have been decentralized to the *prefectura* level. The *Superintendencia Forestal* is responsible for legal oversight of forest resource use and the administration of *Ley Forestal 1700.* The *Direccion de Recursos Naturales y de Medio Ambiente* is responsible for environmental management, environmental assessment, and environmental education. This institution provides for a complete environmental review process that awards environmental licensing.

Within CONCADE, the U.N. FAO agroforestry program, C-23, develops agroforestry activities in the Chapare and provides environmental oversight and landscape monitoring to DAI's agricultural development activities and to road maintenance activities executed by Caminos Vecinales. C-23 has carried out various silvopastoral activities in the Chapare. However, with the onset of the Experimental Phase in 2001, the proposed silvopastoral project was developed within the ProAg unit of DAI.

There is a multiplicity of community-based, second level, and regional institutions working in AD within the Chapare. At a local level, associations have been formed to organize producers both geographically and by product. Most associations are members of second level organizations who then are often organized within UNAs, or *Uniones de Asociaciones.* Training, extension, and services are offered to producers through these first and second level organizations and by local "promoters" who are trained to organize farmers and run workshops.

Alternatives: Alternatives A and B reflect two implementation options for livetsock, pasture and silvopastoral management strategies. Alternative A, Recuperation of Soils and Forest Management, develops forest management plans, rehabilitates and manages pastures, and establishes silvopastoral systems. Alternative A does not directly support livestock production needs. Alternative B, Livestock Productivity, restores and manages pastures, establishes silvopastoral systems, develops production infrastructure, and manages livestock, including distribution of live animals. Alternative B does not adequately address the environmental impacts of increasing livestock capital and production. Alternative C has emerged from workshops carried out with the Evaluation Team and the various scoping and consultation activities. Alternative C includes a logical and integrated progression of farm and forest management planning, pasture recuperation, implementation of silvopastoral practices, and livestock production support. Under Alternative C livestock improvement will not be achieved through a cattle distribution program, although the project can answer this need through existing improved breeds and artificial insemination. The No Action alternative reflects current traditional livestock and pasture management practices that continue to expand the agricultural frontier without rational or strategic planning, and without further assistance through USAID.

Alternative C – Preferred Alternative

Select and Organize Beneficiaries
- Beneficiary prioritization and selection based on ecological and production criteria

Develop Management Plans
- Elaborate forest management plans integrated into comprehensive farm plans

Pasture Recuperation and Management
- Recuperation of compacted pastures
- Herd rotation
- Pasture division

Establish Silvopastoral Systems
- Live fences; multipurpose trees
- Secondary forest enrichment
- Fence riparian zones; protect water sources
- Forage banks

Infrastructure Establishment and Improvement
- Milking facilities
- Corrals
- Water systems; water tanks
- Salt licks
- Manure management

Cattle Production and Management
- Herd stratification
- Sanitation and nutrition
- Protein banks
- No distribution of improved breeds

Training
- Extension and training for farmers and technicians
- Demonstration farms
- Mass communication
- Testing/adaptative management

Environmental Consequences: The alternatives share certain consequences because the implementation of livestock, pasture, and silvopastoral management is based on two assumptions: 1) intensification of production decreased deforestation, and 2) silvopastoral systems are economically viable. However, this assessment surfaces issues that bring into question these assumptions, arguing that continued deforestation and socioeconomic sustainability of cattle production are two of the principal challenges to this project and they are influenced by size and location of beneficiary farms.

The assumptions on which these systems have been established have not been validated. Research on silvopastoral systems around Latin America (Vosti et al.,2001; Cattaneo, 2001; and Roebling & Ruben, 2001) show that under various farm sizes and market scenarios the continued deforestation of primary forest for pasture expansion is directly related to access to capital and labor. On the other hand, CONCADE evaluations prove that silvopastoral systems can be

economically viable and valuable. Silvopastoral systems can answer income needs but will also impart further deforestation if not adequately managed. As opposed to Alternatives A and B, Alternative C addresses the risks of promoting livestock production in a tropical forest environment through a logical progression of planning and regulatory activities that require farmers to implement silvopastoral practices without expanding pasture area.

This EA also identifies the need to develop silvopastoral strategies based on the regional variations in production systems, edaphic conditions and landscape ecology in order to sustain socioeconomic and ecological benefits. Comparing soil limitations with park boundaries and farm size characteristics, it becomes clear that although the entire Chapare would benefit from developing silvopastoral farms, the project needs to initially focus its resources on sensitive lands and along protected area borders. It is here that silvopastoral systems may prove to be the most valuable environmentally and economically. Additionally, from this preliminary assessment, it is evident that livestock, pasture and silvopastoral strategies need to take into account farm size, production goals and limitations, and biodiversity values before providing technical assistance to potential beneficiaries. Compared to Alternatives A and B, Alternative C offers a more comprehensive planning process that incorporates these factors.

Pasture rehabilitation and infrastructure improvement activities stand to impart direct, local and short-term impacts on water quality and the soils. The difference in the impacts from these practices between alternatives is based on the presence or absence of the activity itself. However, currently there is no consolidated guide to the BMPs; practices have been developed by various institutions but are not well known or shared among the various technicians (i.e.; veterinarians, agricultural engineers, and foresters) who work in the field with the farmers.

It is the EA Team's assessment that Alternative C is the Preferred Alternative and its associated activities reasonably address the identified environmental issues while adequately supporting project objectives.

Required Mitigation Measures: Alternative C will require the inclusion of a series of mitigation measures in order to ensure overall environmental compliance. These mitigation measures are summarized in the table below.

Environmental Issue:	Mitigation Measures	Estimated Costs/Responsible Institution	
		Cost	**Responsible party**
Deforestation, expansion of agricultural frontier.	1. Define a compliance strategy based on the norms of Bolivian Protected Area laws and with indigenous land regulations before implementing project activities within protected areas or TCOs.	1. No additional costs	DAI/C-23
	2. Develop a review process that conditions access to USAID supported credit or financing for infrastructure development and plant material on the completion of forest management plans. Financing levels will be based on the calculated carrying capacity of existing pastureland of each farm.	2. One month internal consultancy; $2,000	DAI/C-23
	3. Do not distribute live cattle to beneficiaries, nor provide financing or credit for the purchase of cattle in the immediate or medium term. Improve the gene pool with existing improved stock and artificial insemination. If the project deems it necessary to distribute improved breeds in the future, the activity will be proposed to the USAID/Bolivia Mission Environmental Officer for further review and approval, based on the following studies: a. The project will document the results of distribution of improved breeds during the experimental phase (2001-2003); the study will measure survival rates of distributed cattle, their production, land conservation rates on recipient farms, and the acceptance by the farmer of the introduced animals, among other variables. (See Socioeconomic Sustainability, MM #1.) b. A detailed study of the gene pool of the beneficiaries' herds with specific recommendations for breeds, numbers and distribution	3. No initial additional costs with existing improved stock Artificial insemination, $1500/600 cow. Gene pool study, $100,000	DAI/C-23 *IBTA*
	4. Conduct a policy analysis of environmental management of livestock production that will identify the gaps in regulation and control and create a strategy to develop and strengthen incentives and regulation for silvopastoral management in the GOB context.	4. One month external consultant, $25,000	DAI
	5. Adapt project planning and implementation annually based on the findings and recommendations of a yearly technical and participatory evaluation of project activities. The evaluation will measure the degree to which silvopastoral activities have been carried out and finalized on the farm. Quantifiable indicators such as number of trees planted, survival rates for established trees, number of hectares planted in improved pasture, and carrying capacity should be measured. The evaluation should also incorporate findings from project monitoring, such as water quality data, and technical validation activities.	5. Team of external consultants in participatory evaluation and silvopastoral mgmt, $25,000/year	DAI/C-23
	6. Conduct a supplementary environmental assessment of small livestock production, such as sheep and goats, before distributing them through the project.	*6. Supplementary EA: included in monitoring budget*	DAI
	7. Do not select beneficiaries to participate in the project who are not already raising cattle.	7. No additional costs	C-23

Environmental Issue:	Mitigation Measures	Estimated Costs/Responsible Institution	
		Cost	Responsible party
	8. Communicate – through the life of the project - to potential beneficiaries that farmers who deforest their lands are at risk of losing project benefits.	8. No additional costs	DAI/C-23
Socioeconomic sustainability	1. Develop project implementation strategies based on a characterization of existing systems of production within the Chapare, such as: commercial, subsistence, dual purpose, and *engorde* farms. This study will calculate the threshold at which a farm is a commercial versus subsistence operation based on total pasture size, and analyze the socio-cultural, economic and management factors that define these systems of production and geographically locate them within the project area. The project will also study the results of distribution of improved breeds during the experimental phase (2001-2003), measuring survival rates of distributed cattle, land conversation rates, and the acceptance by the farmer of the introduced animals, as well as asses the farmer's current accessibility to stud services of improved breeds, among other variables, and incorporate these findings in the design of implementation strategies.	1. Two month consultancy: $30,000	DAI
Habitat & biodiversity loss, water pollution, soil erosion	1. Prioritize potential beneficiaries, during project planning, based on the following criteria: location of the farm in biological corridors; presence of degraded pastures; proximity to protected areas; and location on sensitive lands which is defined as slopes greater than 15%, poorly drained soils, and within floodplains.	1. No additional costs	DAI/C-23
	2. Contract a biologist, familiar with the ecological conditions of the Chapare, to develop a simple habitat and biodiversity monitoring program appropriate for implementation by farmers and technicians in conjunction with local extension services. The biologist will determine appropriate indicator species for monitoring change in flora and fauna composition and in ecological dynamics of the ecosystems affected at a farm level by project activities.	2. Bolivian biologist: $16,000/year Equipment: $5,000	C-23
		3. No additional cost	DAI
	3. Condition disbursement of USAID supported credit and financing for fencing on the completion of pasture and herd management training.	4. Bolivian hydrologist: Two months/year, $2400/year	C-23
	4. Contract a hydrologist to develop a subsurface water-monitoring program in which he/she will define the methodology, frequency of measurement, and test sites		

Environmental Issue:	Mitigation Measures	Estimated Costs/Responsible Institution	
		Cost	Responsible party
	appropriate to the hydrological context of the Chapare and the proposed well-drilling activities. 5. Write a Best Management Practices manual of silvopastoral practices and localized mitigation measures based on existing literature from Bolivian institutions and other sites around Latin America with similar environmental conditions.	5. External Consultant: $15,000	DAI

Environmental Issue:	Mitigation Measures	Estimated Costs/Responsible Institution	
		Cost	Responsible party
Integration of forest and environmental management with livestock production	1. Exchange technical knowledge and experience between the representative disciplines of CONCADE technicians and institutions through thematic workshops and the formation of multidisciplinary teams of extensionists. 2. Establish up to three demonstration farms for each identified production system and precipitation zone in the Chapare that can be used for training, promotion, and research in silvopastoral systems and management. 3. Conduct training with beneficiaries in the field – on the farm – developing "field schools" in which farmers learn new technologies by doing them. Include topics such as: sanitary and vaccination calendars; control of foot and mouth disease; herd productive and reproductive registers; and other methods of animal management and control. 4. Establish an early warning system that monitors behaviors and management activities and identifies potential areas of supplementary training or extension support. 5. Carry out participatory research activities with project beneficiaries that test and adapt silvopastoral and livestock production (nutrition, management, sanitation, reproduction) technologies to the biophysical and climatic reality of the Chapare.	1. Three/two-day workshops first quarter, $2,000 1-day workshop Quarterly; $330	DAI/C-23/IBTA
		2. Farm user fee; $100/year Silvopastoral materials & equipment: $4,000/year/farm	IBTA
		3. No additional cost	DAI/C-23
		4. No additional cost	DAI/ ProAg Training Unit

Environmental Issue:	Mitigation Measures	Estimated Costs/Responsible Institution	
		Cost	**Responsible party**
		5. Bolivian participatory research specialist, $16,000/year Compensation of participants, $5,000/year	DAI/Unidad de Capacitacion y Extension
		Total Mitigation Costs: Initial costs: $79,000 Annually: $ 63,320 *Activity dependent, $101,500*	

INTRODUCTION

1.1 Purpose and need for agency action

In 2001, a Supplemental Environmental Assessment (SEA) was conducted for Alternative Development efforts in the Tropics of Cochabamba. (Kernan, 2001.) Alternative Development (AD) is an initiative guided by the USAID Special Objective; "Illegal coca eliminated from the Chapare". AD aims to provide farmers who have left coca cultivation with production alternatives and to establish a licit, sustainable economy in the Chapare of Cochabamba. The 2001 SEA was the consequence of a preceding Environmental Assessment (Kernan, 1998) and a Positive Determination from the 2000 Threshold Decision. One of the results of the 2001 SEA was the requirement of the implementation of a Supplementary Environmental Assessment for CONCADE'S proposed livestock promotion activities. Although Kernan (2001) recognizes the possible benefits of promoting silvopastoral livestock management systems in the Chapare – to stabilize and intensify land uses, increase family incomes, improve soil fertility, maintain biodiversity and improve microclimates – he bases his decision for another SEA on the following considerations:

- There was little information available showing the possible impacts on water quality of livestock activities in the Chapare.
- It is unclear whether a livestock promotion program could restrict activities to degraded pastures and ex-coca fields.
- An evaluation of the merits of silvopastoral systems in the context of the Chapare needed to be made.
- Population growth of cattle in the Chapare exceeds the rate at which degraded pastures can be rehabilitated.

CONCADE, the Counter Narcotics Consolidation of Alternative Development Efforts, is a consortium of United States Government, US NGO and GOB organizations. CONCADE's goal is to contribute to the development of a licit economy in the Tropics of Cochabamba by "supporting efforts that expand and consolidate production and marketing of licit crops, stimulate private sector investment, create employment opportunities, and increase incomes in a sustainable and environmentally sound way." (DAI, 2003.)

The proposed livestock promotion activities respond to the growing meat and dairy production activities in the Chapare. Currently, over 3,300 families are raising 62,135[2] head of cattle on 29,187 hectares of pastureland. Livestock management, pasture management, and land conversion practices for ranching activities have motivated the CONCADE project to develop silvopastoral systems to improve cattle production while also improving environmental conditions. Since 2001, CONCADE has carried out silvopastoral interventions on 187 farms within the Chapare. These activities range from planting live fences to constructing corrals and water systems. One of the activities that the "Silvopastoral Experiment" phase of the proposed activities implemented was the introduction of improved breeds of cattle into a select group of farms with the purpose of improving the genetic stock, thereby improving production and resistance to disease in herds.

[2] From DAI *Encuesta Agropecuario (2002)*, these data vary by the 1,000s between different data sources.

Under Title 216 of the Foreign Assistance Act, Sections 118 and 119 provide guidance to USAID regarding U.S. Congressional policies that should be used when administering U.S. development assistance that will affect areas such as the BUM, which contains tropical forests. Specifically, Sections 118 and 119 highlight the following concerns:

> *The Congress is particularly concerned about the continuing and accelerating alteration, destruction, and loss of tropical forests in developing countries, which pose a serious threat to development and the environment. Tropical forest destruction and loss--*
>
> > *(1) result in shortages of wood, especially wood for fuel; loss of biologically productive wetlands; siltation of lakes, reservoirs, and irrigation systems; floods; destruction of indigenous peoples; extinction of plant and animal species; reduced capacity for food production; and loss of genetic resources*

Section 118 also places *"a high priority on conservation and sustainable management of tropical forests" a*nd requires the donor agency to "*the fullest extent feasible, support projects and activities"*--

> > *(A) which offer employment and income alternatives to those who otherwise would cause destruction and loss of forests, and*
> >
> > *(B) which help developing countries identify and implement alternatives to colonizing forested areas.*

Perhaps even more relevant to the purpose of this SEA is the following Section 118 policy:

> *Deny assistance under this chapter for the following activities unless an environmental assessment indicates that the proposed activity will contribute significantly and directly to improving the livelihood of the rural poor and will be conducted in an environmentally sound manner which supports sustainable development:*
>
> > *(A) Activities which would result in the conversion of forest lands to the rearing of livestock.*

Under this mandate the following Supplement Environmental Assessment of Pasture, Livestock and Silvopastoral Management has been developed for the CONCADE project.

1.2 Evaluation Methodology

The Supplement EA for Pasture, Livestock and Silvopastoral Management (subsequently referred to as the "Silvopastoral Project") was developed based on the performance requirements outlined in the EA Team's 2003 Scope of Work.

1. Define what constitutes "silvopastoral" activities, in the context of the Chapare and in the context of future USAID assistance in the region.
2. Define the environmental issues related to the proposed activities.
3. Define and describe at least three alternatives, including the Proposed Alternative, the No Action Alternative, and a Reasonable Alternative.

4. Review alternatives and solicit public opinion from the affected parties and other interested parties in workshops, public meetings, and other appropriate venues.
5. Recommend to USAID and other participating entities as to which alternative should be selected.
6. Propose in detail realistic mitigation measures for the inevitable environmental impact.
7. Propose a practical system for monitoring the environmental impacts of the proposed activities and the effectiveness of mitigation measures.
8. Provide detailed guidance to USAID, PDAR, C-23 and DAI on practical and workable means to strengthen the capacity of involved institutions and stakeholders to adequately and effectively implement recommended mitigation measures.

The Environmental Assessment Team was made up of Marsha Kellogg, Independent Consultant and Team Leader, Ricardo Ewel, DAI/ProAg, Javier Ardaya, DAI/ Environmental Unit, Marcelo Pinto, C-23/Jatun Sacha, and Jorge Pinto, PDAR. (Appendix C.) The Assessment Team collected data from field visits, scoping meetings, literature review, GIS analysis and key informant interviews, based on the guidance from SOW objectives listed above.

1.2.1 Field Visits

Total time in the field in the Chapare was limited by turbulent political conditions that made it unsafe to travel far from the main roads nor safe to stay for the ten days originally planned. The EA Team visited six farms; four had been recipients of interventions of the Silvopastoral Experiment from 2000 – 2003, one was a beneficiary of C-23/Jatun Sacha projects and the sixth was an example of a farm that had received pasture recuperation help in 1998 but had not received further support. (It was testimony to the environmental impacts of No Action.) During the field visits, the Assessment Team analysed the environmental impacts of the activities of the proposed alternatives based on their magnitude, location, direction and duration. (See Table 4.2.)

1.2.2 Scoping Meetings

Two scoping meetings were held with affected and interested actors. The first took place in the Chapare on October 23, 2003 in the community of Entre Rios. At the meeting, 81 farmers gave voice to their concerns for the environmental, social, and economic conditions of their farms through small group mapping and large group discussion. Overwhelmingly, farmers expressed their interest to work within a Silvopastoral Project. (See Appendix B.) The results of this meeting are incorporated into the discussion of the Affected Environment, Environmental Consequences, and Comparison of Alternatives chapters of this EA.

The second scoping meeting was held in Cochabamba, October 28, 2003, with representatives of the principal actors from USAID, PDAR, DAI, C-23/Jatun Sacha and with the participation of CISTEL, *Centro de Investigación y de Servicios en Teledectección*, of the University Mayor of San Simón. At this meeting the four considered alternatives were presented, along with the mitigative measures of the Reasonable Alternative. Comments were documented and incorporated into the continued development of the EA. (See Appendix B.)

1.2.3 Key Informant Interviews

Because field visits were limited by the tense political situation, the EA Team took advantage of time in Cochabamba to meet with various stakeholders from the following institutions; C-23/Jatun Sacha, USAID, DAI/ProAg, DAI/Environmental Unit, PDAR, Regional Director, Wildlife Conservation Society, GOB Superintendent of Agriculture, and the University of San Simon's CISTEL program, among others. These interviews allowed members of the EA Team to learn about silvopastoral and environmental management activities already in practice, the lessons learned from the experiences of these key informants, and to understand the institutional context within which the Silvopastoral Project would be developed to best answer the question of strengthening their capacity.

1.2.4 Literature Review

The Assessment Team reviewed over 30 documents, reports and evaluations on activities and studies pertaining to the development of the proposed activities. DAI and C-23 key informants provided the majority of these documents to the Team. Relevant information from these documents can be found referenced throughout this evaluation.

1.2.5 GIS Analysis

The Assessment Team had access to DAI's PEMIS geographic information system that facilitated the analysis of spatial issues such as the scale and focus of the proposed activities within regions with different colonization characteristics in the Chapare. The information collected from this process has been essential to the characterization of the Affected Environment and development of Mitigation Measures.

1.3 Limitations to the Study

This assessment was critically limited by the political and social turmoil occurring throughout Bolivia at the time. Field visits were done at the spur of the moment, which resulted in visiting farms but not farmers, because they couldn't be advised of our arrival in time. Two visits to the Chapare took place: the first for approximately 36 hours, the second for 2 ½ days. Although significant scoping took place, the limited time in the field constrained the ground truthing of environmental consequences of the proposed activities. Fortunately, Assessment Team members and key informants had significant experience in the field to contribute.

Little scientific information on the ecology or biodiversity of the Chapare was made available to the Assessment Team. Although satellite imagery analysis and some water quality monitoring have been done, there exist very little baseline data on this remarkably diverse tropical region. (Very late in the EA process, the Team leader discovered a library dedicated to the environmental issues of Cochabamba and the Tropics of Cochabamba at the *Fundación Patiño*. However, there wasn't the time to review this information.)

Despite the limitations mentioned above, the Team Leader believes that this EA provides a sufficient level of rigor in its analysis to provide a strong basis for decision-makers to understand the principal positive and negative environmental consequences of the alternatives considered herein.

2. Affected Environment

This chapter identifies the characteristics of the affected environment as relevant to the analysis of consequences of the proposed activities. As a supplemental EA with two preceding environmental assessments, we have chosen to highlight elements of the affected environment within the contexts of watersheds and their attributing soils, rivers and streams, and wetlands; biodiversity, biological corridors and the threatened and endangered species that rely on them; primary and secondary forests; rangelands and their management systems; existing cattle production systems; demographics; and the policy and institutional frameworks within which the proposed activities function. An expanded discussion of the affected environment can be found in Kiernan's (1998) "Environmental Analysis: USAID Special Objective, Elimination of Illicit Coca from the Chapare".

2.1 Geographic Location

The current location of the Silvopastoral Project is on the 187 farms in the Multiple Use Forest (BUM) that participated in the Silvopastoral Experiment from 2001 through 2003. However, there has not been an explicit determination of the location of the proposed activities subject to this assessment except to say that they will occur within the 565,000 hectare BUM, commonly known as the Chapare. The Chapare is a narrow stretch of land situated at the foot of the Eastern and Mosetenes mountain ranges (*cordilleras* to the south and west) and the Ichilo River to the northeast. (Kiernan, 1998.) (See Maps 2.1, 2.2.) As a growing agricultural development zone, the Chapare is geophysically limited by its premontane and montane topography to the south and flood plains to the north.

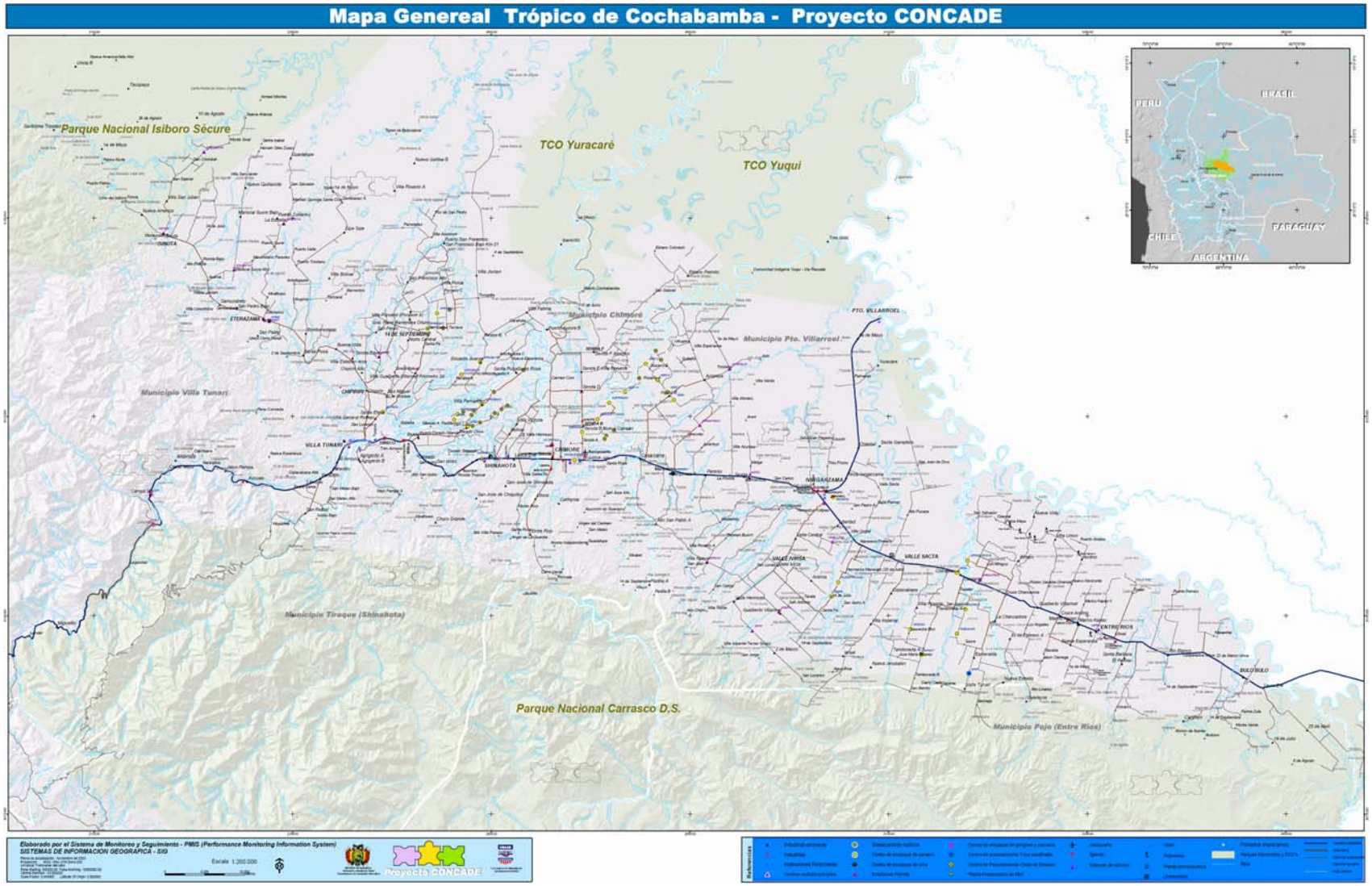
2.2 Watersheds

The Chapare serves as an economic corridor between the Department of Santa Cruz and the altiplano of Cochabamba. With the construction and maintenance of one principal highway and many secondary roads, agricultural and industrial activities have located to this area, on the heels of coca eradication. This corridor bisects two principal watersheds, Isiboro and Mamore, whose tributaries start in the highlands of the Carrasco National Park and the montane forests northwest of the Chapare. Within the Mamore and Isiboro watersheds, PROMIC (2003) has identified eight sub-watersheds (Chapare, Chimore, Ichilo, Ichoa, Isiboro, Isiboro-Secure, Mamorecillo and Secure) and 125 microwatersheds. Geomorphologically, the upper regions of these watersheds are extremely steep and are made up of poorly consolidated sedimentary rock, which contributes to the erosion and landslides that define the mountainous *Cordilleras* to the south and west. (Kernan, 1998.) Combined with annual rainfall rates that span from 5,000 mm in the foothills of the

Northwestern boundaries of the Chapare present high rainfall and topographic challenges to livestock production.

Southern reaches present limitations based on drainage and flooding.

Map 2.2: General Map of the Tropics of Cochabamba



Cordilleras to 2,700 mm in the eastern and northern reaches of the Chapare, water plays an important and often limiting role in the development of this region. The scouring quality of high stream flows and flooding is observed at the wide river crossings where large and mid-size rounded rocks compose the riverbed. However, rivers fan out and meander as they cross the Chapare and head north into the flat TCOs and Beni.

Lowland farms experience saturated soils from intense precipitation and flooding of adjacent second and third order streams. Small patches of wet meadows with their concurring sedges are observed on farms throughout the region. Permanent and ephemeral streams are subject to increasing deforestation and erosion of their riparian zones. Goitia and Surruco's "*Informe Diagnóstico Forestal en el Experimento Silvopastoril*" estimates that along the 71 permanent streams they evaluated on 34 farms, 28% of them are showing significant levels of degradation from uncontrolled movement of cattle up and down stream banks. Anecdotal information from farmers suggests that permanent streams have become ephemeral over time, as microclimates have changed with land conversion. During the scoping meeting in Entre Rios, farmers repeatedly identified water quality and quantity issues that impacted the health of their cows and production levels.

According to preliminary reports, 16% of sampled rivers met or surpassed GOB Class A standards (water does not need treatment for human consumption). (Universidad San Simon, 2002.) Chimore, Cesarzama, and Chinahuaca Rivers show exceptionaly high concentrations of fecal coliform (1000 – 10000 UFC/100 ml), although the sources of this contamination have not been identified yet. Although water quality monitoring results are premature and inconclusive at this time, it will be important to incorporate findings into project planning and monitoring especially as more becomes known of the measurable effects of livestock on water quality.

2.3 Soils

The soils within these watersheds are greatly influenced by the quantity and intensity of the precipitation they receive. According to Bazan's (2000) report, "*La Problematica de la Degradacion de Pasturas en El Tropico de Cochabamba*" a soil's capacity to drain is a principal contributor to the tendency of the soils in the TC to compact. Additionally, Bazan notes:

> *cattle production areas clearly show low fertility conditions; it is characterized by low pH levels, low concentration of organic materials, high concentration of changeable aluminium…*

The soil's chemical qualities, heavy rainfall ten months of the year, and two months of almost drought-like conditions cumulatively contribute to soil compaction and erosion. Lands that have been converted from forests to pasture show a higher propensity to compact and erode especially under current rangeland management practices. According to Monteith (1995), viable pastureland production is reliant on mechanical sowing and continuous inputs to reduce acidity.

> *There is a wide variety of soils. All the soils require a certain **normal** amount of inputs and most of them require more than the **normal** quantity. Soil classification and mapping in the Chapare with the FCC system indicates that the main limitations for agricultural activities include: (1) aluminium acidity and toxicity; (2) low potassium reserves; (3) water saturation; and (4) steep slopes…(Monteith, 1995.)*

Poor management of these infertile soils indirectly contributes to deforestation as farmers abandon overexploited and compacted agricultural lands in search of "greener pastures" under the forest cover.

2.4 Primary and Secondary Forest

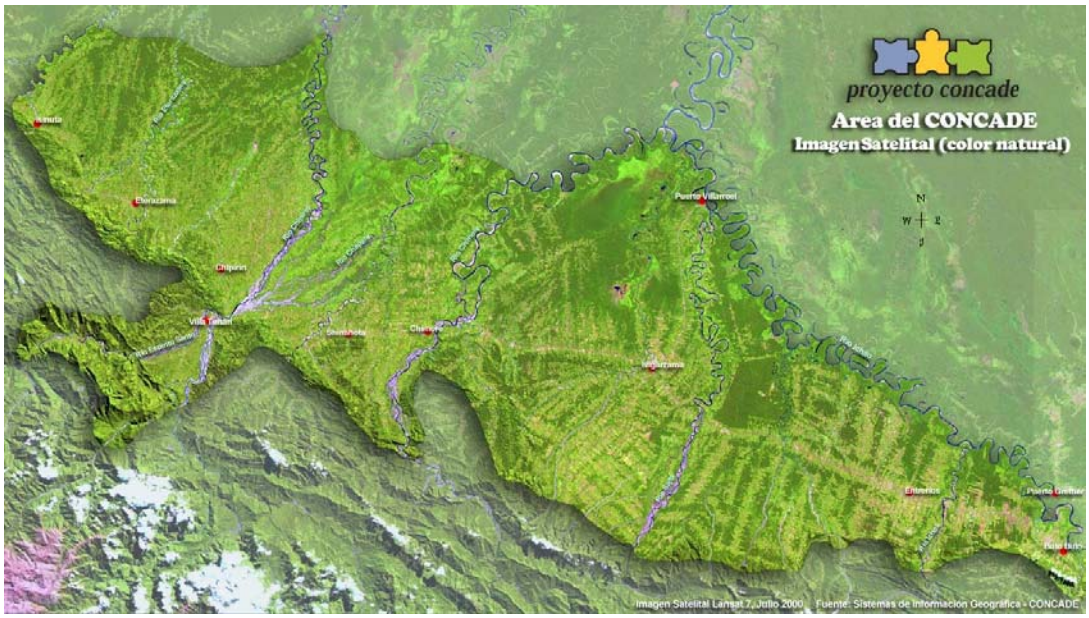
The Chapare is bound by four important protected areas: Carrasco National Park to the south, TIPNIS (Indigenous Territory and Isiboro Secure National Park) to the northwest, and TCOs (Communal Territory of Origin) Yuracare and Yuqui to the north, all of which support significant expanses of contiguous primary forest.

Protected Areas to the north, west and south are experiencing increasing colonization and deforestation.

Primary forests around Villa Tunari have experienced greater exploitation than forests to the east

According to satellite images from 1990 and 2000, primary forest cover within the BUM has decreased 20% over the past ten years. It is estimated that 10,000 – 15,000 hectares of forest were burned per year prior to 1997; however, deforestation rates seem to be decreasing. (Minnick, personal communication, 2003.) Currently, 60% of the Chapare is primary (40%) and secondary (20%) forest. Satellite imagery also provides a clear picture of the forest conversion impacts of settlement and agricultural development along established roads and riverways. (See Map 2.4.1.) Some of the colonization has reached and breeched protected area boundaries specifically moving into Carrasco National Park to the southeast and the TIPNIS in the northwest. According to C-23 data, 10% of the TIPNIS has experienced colonization stemming from the Multiple Use Zone.

Map 2.4.1.: Satellite Image of Chapare (deforested, converted lands are yellow).



DAI's "*Evaluación Técnico Economica del Experimento Silvopastoril en el Tropico de Cochabamba*" shows that the majority of large-sized farms (greater than 30 ha.) harbor the greatest surface area of primary forests; covering approximately one-third of the farm surface area. According to the *Superintendencia Forestal*, 175,000 hectares of forest within the Chapare are currently administered under Forest Management Plans.

The following is a listing of the commonly found and exploited tree species in the TC (DAI, 2001; C-23 EA; 2001):

Table 2.4.1: Common tree species in TC

Common Name (Spanish)	Species	Family
Ochoo	*Hura crepitans*	Euphorbiaceae
Almendrillo	*Dipteryx odorata*	Fabaceae
Sangre de toro	*Virola sebifera*	Myristicacaea
Mapajo	*Ceiba pentandra*	Bombacacaea
Blanquillo	*Terminalia sp.*	Combretaceae
Verdolago	*Terminalia amazonica*	Combretaceae
Trompillo[3]	*Guarea sp.*	Meliaceae
Leche	*Sapium sp.*	Euphorbiaceae
Urupí	*Clorisia ilicifolia*	Moraceae
Mara	*Swietenia macrophylla*	Meliaceae
Jorori	*Swartzia joroni*	Caesalpiniaceae
Gabun	*Virola peruviana*	Myristicaceae
Yesquero	*Cariniana estrellensis*	Lecythidaceae
Laurel	*Nectandra sp.*	Lauraceae
Cedro	*Cedrela sp.*	Meliaceae
Tajibo Amarillo	*Tabebuia serratifolia*	Bicnoniacaeae

[3] Species best adapted to the varied precipitation and soils of the Chapare.

Goitia and Surruco's (2003) report stratifies the farms they surveyed into two distinct zones in the TC based on forest composition and structure. The first, between Villa Imparial and Bulo Bulo, supports primary forest with the most commercial value. Table 2.4.2 lists these timber species.

Forests surveyed in the second zone, between Ivirgazama and Villa Tunari, show lower composition of commercially valuable species, compared to the first zone, due to soil types and a longer period of selective harvesting by settlers. Goitia and Surroco (2003) estimate 80% of existing primary forest on farmlands throughout the TC is suitable for commercial exploitation under Forest Management Plans. Twenty percent of the primary forest is suitable for extraction for domestic use and source water protection.

Table 2.4.2: Commercial Tree Species Villa Imparial – Bulo Bulo

Common Name (Spanish)	Latin Name	Family
Charque	*Eschweilera coriaceae*	Lecythidaceae
Puca puca	*Hyronima oblonga*	Euphoribiaceae
Palo roman	*Tapirira sp.*	Anacardiaceae
Verdolago Negro	*Buchenavia puntata*	Combretaceae
Verdolago amarillo[2]	*Terminalia amazonica*	Combretaceae
Sauco	*Zanthoxylum sp.*	Rutaceae
Sujo	*Sterculia apetala*	Stericuliaceae
Negrillo	*Nectandra sp.*	Lauraceae
Mani	*Pithecellobium corymbosum*	Leguminoceae
Almendrillo	*Dipteryx odorata*	Fabaceae
Laurel[2]	*Ocotea sp.*	Lauraceae
Ochoo	*Hura crepitans*	Euphoribaceae
Bibosi	*Ficus sp.*	Moraceae
Coloradillo	*Spondias lutea*	Anacardiaceae

2.5 Biodiversity: Biological Corridors, Endemic, T & E Species

Although a biodiversity survey has not been completed for the Multiple Use Forest zone, wildlife data from neighboring Carrasco National Park and regional reports on the Tropics of Bolivia illuminate the importance of the Chapare as habitat for endemic, threatened and endangered species.

The International Council for Bird Preservation identifies the lowlands of Bolivia, including the Chapare, as an endemic bird area. (Fernandez, 2002.) SERNAP (2003) estimates seven hundred bird species exist within the Carrasco National Park, 247 of which are registered. The following endemic birds have been identified: *Simoxenops striatus, Grallaria erythrotis, Myrmotherula grisea, Oreotruchilus adela, Aglaeactis Pamela, and Schizoeaca hartert.* Thirty-seven bird species migrate from North America to the Bolivian tropics.

Cursory assessments of the Tropic of Cochabamba environment (DAI, 2001; C-23, 2001) and SERNAP data on Carrasco National Park have documented 382 faunal species, 51 of which are large mammals. Table 2.5.1 is a list of important wildlife species.

There is still very little known about the ecology of the fish of the Andean piedmont in Bolivia. Sarmiento and Barrera (1997) indicate 181 fish species exist between 300 and 1500 m above sea level in the Mamore watershed. Lauzanne, Loubens and Le Guennec (1991) cite 93 species in this altitudinal range in the Chapare watershed. (U. of San Simon, 2002.) However, according to the preliminary report, *Monitoreo A La Calidad De Los Cursos De Agua En El Tropico De Cochabamba* (2002), between 3 and 17 species of small-size fish were caught during monitoring activities in the various classes of rivers and streams within the Tropics of Cochabamba. Economically important fish species such as the pacu (*Muleus setiger y Melius pacu*), sabalo (*Prohilodus nigricans*), and surubí (*Pseudoplatystoma fasiatum*), are present but under increasing pressure from fishing. However, fishing is the only wildlife extraction activity

Table 2.5.1: Important Wildlife Species

Common Name (English/Spanish)	Latin name
Jaguar/ Jaguar	*Felis onca palustris*
Puma/Puma	*Felis concolor acrocodia*
Ocelot/Ocelote	*Felis pardalis Steinbach*
Otter/Lobita del rio	*Lutra longicaudis enudris*
Freshwater dolphin/Bufeo	*Sotalia pluvialis e Inra geoffrensis boloviensis*
Condor/Condor	*Sarcoramphus papa*
Owl/Lechuza	*Otus choliba*
Falcon/Búho	*Falco sparverius*
Hawk/Halcon	*Buteo magnirostris*
Opossum/Carachupa	*Didelphys sp.*
Melero	*Eira Barbara*
Agouti/Jochi pintado	*Agouti paca*
Agouti/Jochi Colorado	*Dasyprocta variegate*
Mono Martin	*Cebus paella*
Tropero	*Tyassu pecari*
Anteater/Oso hormiguero	*Tamandua tetratactyla*
Tejon	

currently controlled by the GOB in the Chapare. According to the DAI (2001) report, the dry months of June, July, and August present stressful conditions for wildlife as water becomes scarce.

As mentioned previously, the Chapare acts as an economic corridor between Santa Cruz and the highlands of Cochabamba. However, its roads and settlement patterns act as a barrier to wildlife migration and movement between the large protected areas to the north and south. As Map 2.5.1 shows, deforestation occurs along rivers and streams where cattle can access water which impacts riparian vegetation, biological corridors, and water quality.

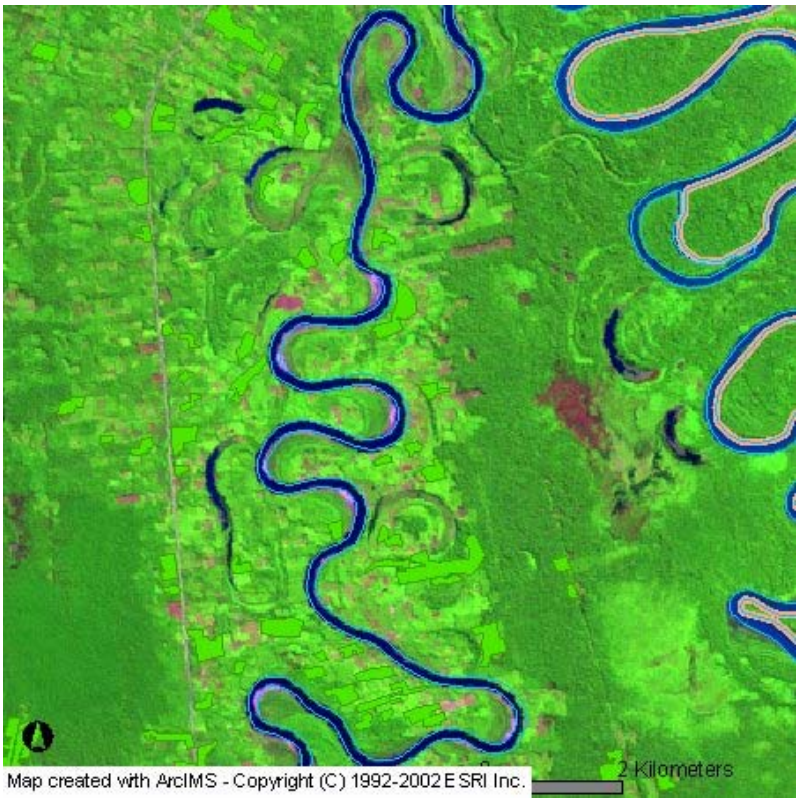
The fragmentation of the landscape by agricultural fields also contributes to stress on existing biodiversity. The environmental assessment conducted on the experimental phase of the silvopastoral project states:

> *Although it does not occupy much space [*The Chapare*] (13%) is located in critical zones for its problems with natural vertical corridors, connectivity and migration and its relation to Carrasco and Amboró protected areas. On the other hand, the genetic flow between pre-andean and sub-andean forests (which is more*

important for maintenance of biological processes than latitude migration), presents breaches in connectivity and critical conservation conditions. (Fernandez, 2002.)

However, there still exists a significant surface area of primary and secondary forest, (60%) which, with proper management, could provide an array of corridors and patches to support existing biodiversity. Detailed studies of habitat requirements of existing threatened, endangered, and endemic species within the BUM have not been developed yet, and therefore this analysis can make only general landscape level conclusions on the impacts of the proposed actions on biodiversity.

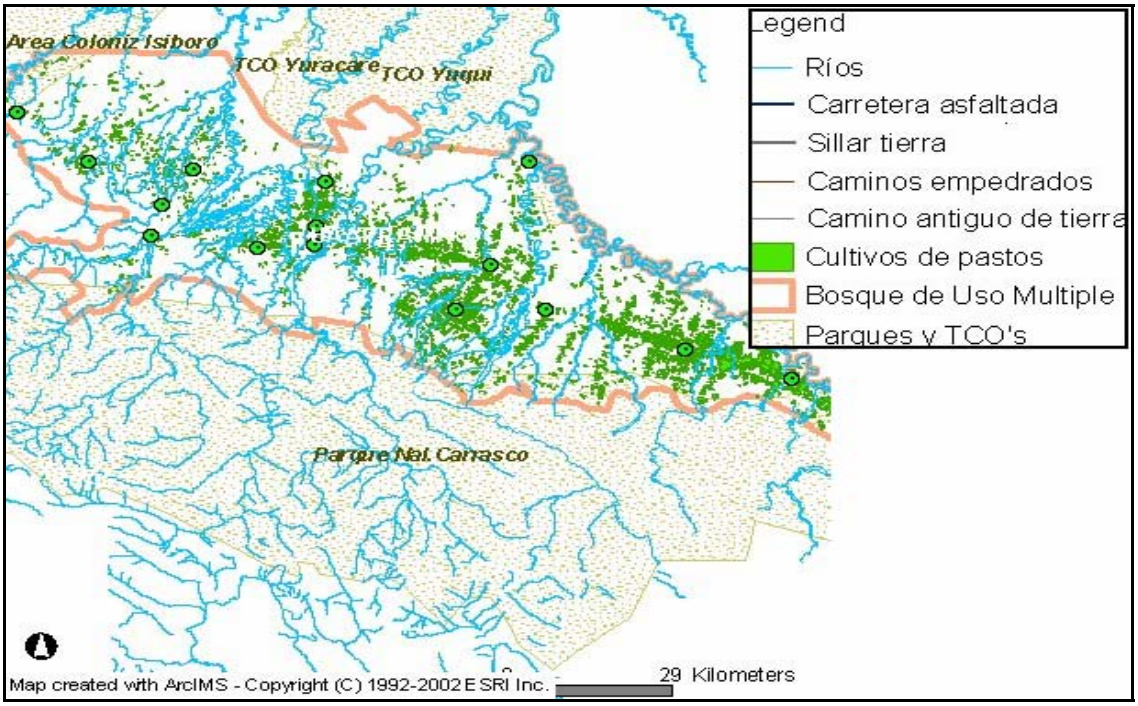
Map 2.5.1: Pastures (light green parcels) and Land Conversion Along Rivers.



2.6 Rangeland Management Systems

Of the 550,000 hectares that make up the BUM, 32,500 are considered pasturelands.(See Map 2.6.1.) It is uncertain what percentage of pasturelands are severely degraded, but according to DAI (2002) agricultural census data, 62,135 head are grazing 29,187 hectares. This infers a stocking rate of 2.1 head/hectare. Even under improved pasture management systems, the Silvopastoral Experiment shows that sustainable stocking rates do not exceed 2.0 head/ha. These figures suggest that the current livestock management system - one that is developed on low quality native grasses and with little soil conservation or herd rotation strategies - results in potentially high rates of pasture degradation.

Map 2.6.1: Pastures of the Chapare



Bazan's (2000) report indicates that the logic of agricultural production in the Chapare has not been based on soil types. In general, existing production activities and soil distribution is very irregular, a characteristic common to tropical regions. Pastureland has developed on top of a diversity of soil types; however, 63% have been established on Class III (based on U.S Soil Service Taxonomy) soils, or those recommended for agricultural use. (Bazan, 2000.)

Current unimproved rangeland management systems are based on the slash-and-burn practices carried out here as a form of claiming ownership of unsettled land. Although cattle were not the original source of forest conversion (coca plantations were primary in the 1980s) cattle have filled the production void that coca eradication created, along with other AD crops. The traditional method of rangeland and herd management is cyclical. It begins by slashing and burning forest, for cultivation of subsistence and commercial crops and to lay claim to the colonized land. When crop productivity fails due to soil infertility, the open space is fenced and used for grazing. Cattle graze freely, overgrazing the emergent grasses. Most pasturelands are established adjacent to bodies of water - perennial streams and ephemeral arroyos into which cattle are allowed to freely roam. Ranchers continue expanding their pasturelands, through slash-and-burn practices, as existing pasturelands compact and degrade, reducing productivity.

Farm size increases from west to east. Average pasture size does not exceed 20 hectares.

The typical farm in the Chapare shares a border with a road or *senda*, near which the house is located. A rectangular shape, domestic crops are grown closer to the home while pastureland extends back from the house up to the secondary or primary patch of forest that might still exist

on the land. Generally, degraded pastures are closer to the home because as they are overgrazed, the farmer clears more land behind it to create new pasture. Drawings from the scoping meeting held in Entre Rios show that most farms have between 10 - 20 hectares of pasture while the rest of the land is in secondary growth or primary forest (average 10 hectares). Farm size within the Chapare varies: in the zone around Villa Tunari they tend to average 10-15 hectares; around Valle Ivirsa they average 25-40 hectares but support more primary forest; and around Entre Rios they average 35-60 hectacres. (Guitierrez, 2003.) According to the FEGATROPC business plan, 35% of sampled producers own 6 - 20 hectares of land; only 7% own greater than 50 hectares. (FUNDES, 2002.)

Farmers in the Chapare have mentioned to AD extensionists that they like raising cattle because "it requires the same amount of labor as coca production", which was not labor intensive. The colonist population occupying the Chapare customarily kept cows in their altiplano homelands as sources of milk and meat for domestic consumption. In the Chapare, milk production provides the farmer with a daily source of income while cattle are also perceived as bank accounts that can be sold for slaughter when times are tough. The cow (or bull) also serves as a status symbol among the farmers. The more head of cattle you have the richer you are. Additionally, both men and women own cows. According to DAI extensionists, farmwomen are often the principal herd manager while the men are responsible for land and infrastructure improvements.

2.7 Livestock (cattle) Management and Production

According to CONCADE's (2001) "*Plan Piloto Silvopastoril Fase Experimental Con Planificación Para La Segunda Fase*", 81% of farmers raise cattle for both milk and meat. The results from the *"Evaluación Técnico Economica del Experimento Silvopastoril en el Tropico de Cochabamba"* (Guitierrez, 2003.) show that 87% of the silvopastoral farms were profitable; they experienced greater than 12% rate of return on the investment projected over a five-year period. On a daily basis, dairy farmers currently produce on the average 4 liters, earning approximately $5.00 per day on milk production. In 2002 the value of meat sales in the Chapare reached $2,300,000.00 while milk sales accrued $645,000.00. (DAI, 2003.) Of the farms surveyed by Sciaroni (2001), 89% were raising Holstein, Pardo Suizo, Criollo and Jersey.

The following management factors define the environment in which livestock is currently produced in the Chapare:

Sanitation: Consultations carried out for CONCADE by CEVEP in 2001, demonstrate that the greatest concern of most ranchers is internal and external parasites. Ticks and hemoparasites affect cattle health, particularly the improved breeds, as do warts (Papilomatosis) which are associated with external parasite attacks.

Among the diseases affecting livestock, the most important is the foot-and-mouth disease. Since the Tropics of Cochabamba export a variety of fruit, there should exist a vaccination program to avoid impacting the commercialization of such products. For this reason, CONCADE has supported three vaccination campaigns (2001, 2002, 2003).

Although there have been no significant outbreaks of other diseases in the TC, currently a calendar for vaccination, sanitation and livestock-related activities to be carried out in the zone does not exist.

Nutrition: Livestock nutrition in the TC is based – as in most livestock programs in Latin America – mainly on grasses. Grazing is widely done without any management or division causing degraded pastures in almost every farm due to over- and under-grazing.

Additionally, very few ranchers provide nutritional supplementation, either protein or mineral, to their cattle. This results in relatively low productivity indices.

Reproduction: In the TC, reproduction rates are worrisome, at about 40%, although farmers do not keep records that prove this. There are no cattle selection programs. In addition, the low genetic quality of herds has resulted in cattle in-breeding; this is a consequence of an inadequate herd management with no stratification or categorization.

The inadequate management of these factors has a direct influence on the quantity and quality of production, and makes the farmer uncompetitive in the current milk and meat market.

2.8 Human Population: Demographics and Land Use

The Chapare has supported waves of colonization since the Incas developed it for food production in 1471 A.D. (Kernan, 1998.) Over the centuries it has experienced migratory influxes of missionaries, explorers and traders; however, until the second half of the 20th century it was mostly occupied by local indigenous groups. In 1946, only 3,000 families lived in the Chapare. This population rose precipitously when the Bolivian government promoted the region for poverty alleviation purposes in 1967, and the establishment of a road from Cochabamba into the Chapare in 1972 increased the colonization drive. By 1976, the population had risen to 117,000. (Kernan, 1998.) Many more migrants were drawn to the area in the 1980s as international coca sales boomed.

Currently, 178,769 people live in the five municipalities that influence the Chapare. (Censo Nacional, 2001.) Sixty percent of the population is male and 40% is female; figures that reflect the colonist nature of the population and this region. (Proyecto CONCADE, 2001.) The western region, around Villa Tunari has experienced a 1.16% population increase between 1992 –2001. The Chimore and Puerto Villaroel regions have experienced a 6.3% and 5.0% growth rate, respectively. The literacy rate is an average of 77%.

Population growth rates are higher around Chimore and Puerto Villaroel.

Alternative Development identifies beneficiaries of the project as the ex-coca growers who have eradicated their coca cultivations and are dedicating their lands to alternative forms of production. Many of the beneficiaries are members of first- and second-level organizations who work closely with the Alternative Development program, all of whom are located within the Multiple Use Forest Zone, or Chapare.

2.9 Policy and Institutional Framework

There is a multiplicity of community-based, second-level and regional institutions working in AD within the Chapare. At a local level, associations have been formed to organize producers both geographically and by product. Most associations are members of second-level organizations who then are often organized within UNAs, or *Uniones de Asociaciones.* Training, extension and services are offered to producers through these first- and second-level organizations and by local "promoters" who are trained to organize farmers and run workshops.

On a local level, outside of the auspices of Alternative Development, coca growers are organized under the umbrella of one confederation within the Tropics of Cochabamba. Structurally, 300 community-based syndicates belong to 53 *Centrales*, which make up the six Federations; Carrasco, Mamoré, Chimoré, Sinahota, Chapare and the *Especial del Tropico*. Currently, AD does not work with the confederation at any level.

On a regional level, GOB and non-governmental institutions share overlapping boundaries of intervention. PDAR, the regional Bolivian Alternative Development institution, directed by the Bolivian Vice Ministry of Alternative Development, coordinates and supervises USAID funded CONCADE initiatives in the Chapare and Las Yungas as well as EU funded ones. DAI, C-23, OIT, Caminos Vecinales, PRAEDAC, Health, and IBTA are all executors of various initiatives. Within CONCADE, C-23 develops agroforestry activities in the Chapare and provides environmental oversight and landscape monitoring to DAI's agricultural development activities and to road maintenance activities executed by Caminos Vecinales. C-23 has carried out various silvopastoral activities in the Chapare; however, with the onset of the Experimental Phase in 2001, the proposed silvopastoral project was developed within the ProAg unit of DAI.

DAI implements various agricultural development projects that provide support in the form of plants and seeds, equipment, training, extension, marketing and commercialization – among others - to UNAs around the Chapare. Within DAI an Environmental Unit leads DAI project planners through an internal review process. Mitigation measures are one product of DAI's environmental review, in the form of *Dictamenes*, which are defined on a case-by-case basis. In the case of the silvopastoral activities implemented from 2001to 2003, DAI's environmental unit established various mitigation measures that helped define best management practices of a silvopastoral project within the context of the Chapare.

Currently, the C-23 monitoring program is integrating its environmental management process with the GOB process to be sure project activities comply with the following Bolivian environmental laws:

Law 1333 (1992): Regulates human activities with the objective of protecting the environment and natural resources, and promoting sustainable development. Article 47 established source and surface water protection policies stating,

> *All of the residuals water, crude or treated, discharged into rivers or arroyos, coming from domestic, industrial, agricultural, livestock or whatever other activity that pollutes the water ought to be treated previous to their discharge, to control the possible contamination of aquifers through infiltration, taking into account the possibility that these rivers and arroyos eventually are used for recreational and other uses. (Author's translation.)*

Forestry Law 1700: Establishes norms for the sustainable use and protection of Bolivia's forests and forestlands to the benefit of current and future generations. It provides for protection of riparian zones, rivers, arroyos and other "environmental services". Law 1700 also enables the *Planes de Ordenamiento Predial (POP),* which provides detailed land evaluations, land use recommendations and mitigation measures for farmers who have settled on *predios* – large tracts of land obtained through Agrarian Reform. The Agrarian Superintendent oversees the development of POPs. According to Bolivian policy, institutions working with landowners are supposed to respect the norms laid out in the POP of each landowner. However, implementation of these land evaluation and capability assessments have been limited by the GOB's and individual landowner's ability to pay.

Administrative Decentralization Law 1654: Defines the roles and mechanisms for citizen participation and cooperation between the GOB and civil society. It requires *prefectures* to prepare socioeconomic development plans, within which they must plan for the conservation and preservation of their natural environment. The *prefectura* has also been given the responsibility to support institutional development of municipalities.

Laws 1654 and 1700 work simultaneously to provide land use planning and control mechanisms at departmental and local levels.

The Chapare is one province within the Department of Cochabamba and is made up of five municipalities; Sinahota, Villa Tunari, Chimoré, Puerto Villaroel, and Entre Rios. Municipalities autonomously decide how to distribute funding that they receive from the central government for public and social works projects. Under Bolivian law, municipalities are required to develop the PLUS, *Planes de Usos de Suelos*, or land use plans. Currently, relations between Alternative Development and the municipalities are developed through PRAEDAC, a European Union funded institution.

On a departmental level, POT's, *Planes de Ordenamiento Territorial*, are developed by the *prefectures*. Bolivian *prefectures* are the seat of departmental government made up of a *Prefecto* - a political appointee - and his/her *Concejeros Departmentales.* This decision-making body directs funding for various public works and social programs on a departmental level. The *prefecture's* relationship with the Alternative Development program is very limited at the moment. Very few activities are directly coordinated between the two.

On a national level, much of Bolivia's environment and natural resources regulatory agencies have been decentralized to the *prefecture* level. The *Superintendencia Forestal* is responsible for legal oversight of forest resource use and the administration of *Ley Forestal 1700.* The *Direccion de Recursos Naturales y de Medio Ambiente* is responsible for environmental management, environmental assessment, and environmental education. This direction provides for a complete environmental review process that awards environmental licensing.

Together, these GOB institutions and laws enable layers of environmental management and land use planning mechanisms that help define land use strategies for the Chapare.

3. Considered Alternatives

At the start of this Supplemental Evaluation, two alternatives were presented to the Team Leader as competing courses of action in the development of livestock, pastures, and silvopastoral management. Alternatives A and B reflect these two proposed strategies. Alternative C comes out of a series of workshops with the Assessment Team and the various scoping and consultation activities that define livestock, pasture and silvopastoral management activities in the context of the Chapare, and the possible environmental consequences of these actions. The No Action alternative reflects current, traditional livestock and pasture management practices executed by the approximately 4,500 ranchers in the Chapare. (See Table 3.1.)

3.1 No Action

Conventional livestock management in the TC is characterized by low productivity due to inadequate management of animal, soil, and environmental resources. Several diagnosis of production systems carried out in the ranching area of the TC show that traditional management of existing pastures leads to environmental degradation. High stocking rates and overgrazing (more than two animals per hectare), low soil fertility and acidity, in some cases soil compaction, inadequate drainage, and lack of replacement of nutrients extracted from the system, are the principal causes of pasture degradation in the zone. Pasture degradation results in lack of sustainability of the system and leads to clearing of new primary and secondary forest areas to sow new pastures, which damages ecological systems and biodiversity structure. (Informe de Avance Experimento Silvopastoril, 2002).

3.2 Alternative A: Recuperation of Soils and Forest Management

This alternative focuses on recuperating and managing pastures, managing existing forest land, increasing tree cover and biodiversity values through establishment of silvopastoral systems, and protecting streams, rivers and other water sources.

Alternative A requires farmers to plant trees along fence lines to serve as "live fences", to plant small woodlots and trees that serve as forage, and fence off riparian zones and wetlands. Alternative A also develops forest management plans with farmers whose property still supports primary or secondary forest.

Additionally, Alternative A selects beneficiaries based on their need to recuperate pastures. Compacted pastures will be recuperated through a process of plowing, raking to level the plowed area, planting improved grass seed, incorporation of nitrogen-fixing legumes, and continued management of the recuperated pastureland. Alternative A recommends herd rotation methods and pasture divisions to ensure pasture maintenance. Some pastures may require a succession of

plowing and seeding, then planting of commercially valuable trees and domestic crops, before cattle are allowed on the parcel. This protects tree seedlings from damage by grazing cattle by not allowing the grazers into the newly-planted area.

Environmentally, Alternative A offers a simple course of action with the least amount of negative environmental impact; however, it does not fully address livestock production elements that have environmental consequences and can improve family incomes.

3.3 Alternative B: Livestock Productivity

This alternative is mainly based on providing support to the local organizations and associations in cattle production and management, pasture management and recuperation, and the introduction of high-quality cattle breeds.

These strategies especially work to increase production and mitigate cattle raising impacts in a very localized (within the farm) way. To achieve these objectives, pasture recuperation practices and silvopastoral activites are implemented on the farms, including the association of grasses and legumes, the utilization of live posts, and the establishment of forage banks. In pasture management, the use of pasture division is emphasized, as well as access to water tanks and salt licks, adequate rest and occupation periods and adequate carrying capacity.

Cattle management and selection addresses animal productivity by improving nutrition – partially solved by pasture improvement and management – through the utilization of by-products from the region, and minerals. Reproduction and genetic improvement activities are based on use and management of registers, therefore Alternative B also promotes vaccination and planning practices and training in basic sanitary problem detection and treatment.. To accelerate the animal improvement process in the Tropics of Cochabamba, this alternative proposes that a simultaneous selection of improved breeds from other similar zones, and acquisition and distribution among project beneficiaries, be carried out.

Another important component of this alternative is productive infrastructure development on the farm, such as corrals, water systems, and milking facilities, with the purpose of increasing the quantity and improving the quality of the final product.

All of the above mentioned activities are accompanied by a complete extension and training program.

3.4 Alternative C: Comprehensive Livestock, Pasture and Environmental Management

Alternative C provides a silvopastoral strategy that integrates environmental protection activities and cattle production with a regional and local planning perspective. As the preferred alternative, it selects and organizes beneficiaries based on a prioritization of the critical ecological areas within the Chapare, and an understanding of the goals and strategies of the production systems in place. Criteria such as sensitive lands, soil capacity, proximity to protected areas, and farm size and capacity are taken into account during the planning phases of the project.

Alternative C develops forest management plans and silvopastoral systems as an integral part of a more comprehensive farmland management plan. Farmers' goals and production capacity over

a 10 - 20 year period are factored into the plan. Live fences, protein banks, woodlots, and riparian protection strategies are designed into the farm plan to protect waterways, diversify sources of income on the farm, and improve the connectivity of the ecological landscape that the farm fits into. Pastures are recuperated and managed with short, medium, and long term carrying capacity in mind. Productive infrastructure is developed to provide farmers with the resources to improve their production and protect water sources.

Alternative C focuses significant resources on the management of a healthy herd based on the improved pastures and their management, protein banks, herd stratification, and farmer training in veterinary “first aid”, sanitation and nutrition. Although genetic improvement activities such as artificial insemination and stud services of existing improved breeds can be developed, no new cattle will be distributed or financed under Alternative C.

There is a heavy emphasis in this Alternative on an integrated extension and training system that prepares and establishes multidisciplinary extension teams; focuses training in the field; communicates the message “less is more” to a wider audience; and incorporates the participation of the rancher in the research and monitoring of silvopastoral activities.

Table 3.1: Considered Alternatives and Their Principal Program Components

Components	**Alternative A** Focused on pasture recuperation and forest management	**Alternative B** Focused on cattle production	**Alternative C** Preferred; comprehensive cattle, pasture and environmental management	**No Action Alternative** Conventional ranching system in the Chapare
	Description of Components by Alternatives			
Selection and Organization of Beneficiaries	• Rancher group organization and strengthening	• Rancher group organization and strengthening	• Beneficiary priortization and selection based on ecological and production criteria	
Development of Management Plans	• Forest management planning	•	• Integrate forest management planning into comprehensive farm plans	• Slash and burn of forest cover • Sowing of annual crops for family consumption
Pasture Recuperation and Management	• Recuperation of compacted pastures • Herd rotation • Pasture division	• Recuperation of compacted pastures • Herd rotation • Pasture division	• Recuperacton of compacted pastures • Herd rotation • Pasture division	• Overgrazed pastures • Utilization of native grasses with low protein content
Establishment of Silvopastoral Systems	• Live fences; multipurpose trees • Secondary forest enrichment • Fence riparian zones; protect water sources • Forage banks	• Live fences • Bridges • Forage banks	• Live fences; multipurpose trees • Secondary forest enrichment • Fence riparian zones; protect water sources • Forage banks	•
Infrastructure Establishment and Improvement	•	• Milking facilites • Corrals • Water systems; water tanks • Salt licks	• Milking facilities • Corrals • Water systems; water tanks • Salt licks • Manure management	• Milking and herd mismanagement in pastures
Cattle Production and Management	• Protein banks	• Herd stratification • Genetic improvement; introduction of improved breeds • Sanitation and nutrition • Protein banks	• Herd stratification • Sanitation and nutrition • Protein banks • No distribution of improved breeds	• Cattle in-breeding • Malnutrition • Minimal sanitation practices
Training	• Rancher training	• Extension and training for ranchers	• Extension and training for farmers and technicians • Demonstration farms • Mass communication • Testing/adaptative m'g'mt	•

3.5 Considered Alternatives That Were Dismissed

The following two alternatives were considered as possible courses of action to fulfill the objectives of the project while reducing environmental impact. However, the Team felt neither alternative adequately addressed the immediate land use and resource management needs of the potential beneficiaries in the Chapare, and therefore did not meet project objectives. At the same time, these two dismissed alternatives do not directly mitigate the environmental impacts of the expanding development of livestock production in the BUM.

3.5.1 Alternative D: Institutional Building and Policy Development

Currently, the GOB exercises very little regulatory control over land use and cattle production. Besides the "Control and Eradication of the *Fiebre Aftosa*" policies outlined in the technical regulations of PRONEFA, little environmental management guidance is provided in Bolivian law to control and regulate cattle production in the Chapare. Under this alternative, a policy study would be carried out to identify the strengths and weaknesses of the current policy environment in the context of livestock, pasture, and environmental management, and project investments would be placed in developing strong policy and regulatory mechanisms to oversee and control cattle development in the Chapare. Project investments would be focused in two distinct but overlapping areas: developing livestock management policy and strengthening the institutions that would play regulatory and implementation roles. Specifically, Alternative D would fortify the land use planning institutions such as the *Superintendencia Agraria* and support the development of the POP (*Planes de Ordenamiento Predial)* among all beneficiaries. Inter-institutional cooperation mechanisms would be developed between the various GOB, NGO and second-level organizations within the Chapare to develop and support policy outcomes. Land use and control strategies would be developed with administrative units within and adjacent to the Chapare such as the municipalities, TCOs, and National Parks. Although policy development and institutional capacity building are essential components to the sustainability of environmental management within the Chapare, this alternative does not adequately address the more immediate management needs of the perceived beneficiaries.

3.5.2 Alternative E: Training and Extension

Under this alternative, project activities would focus solely on capacity building among the beneficiaries of the project. Investments would be placed in training farmers and project and GOB technicians in silvopastoral practices and livestock and pasture management. This alternative relies on the farmer and the various second-level organizations to financially provide for the implementation of silvopastoral practices on their lands. Included in this alternative are eco-auditing and monitoring activities that would be carried out through citizen groups to develop local knowledge of the impacts of ranching in the tropics and to develop local regulatory mechanisms. Additionally, this alternative would focus a significant amount of resources in researching and validating promoted livestock, pasture and silvopastoral management technologies in the tropics.

No investments would be placed in the actual implementation of these silvopastoral activities on the ground. Although capacity building is a crucial element of any conservation and development project, this alternative does not fully address the immediate socioeconomic or environmental management needs of the Chapare, nor does it effectively fulfill AD project objectives.

4. Analysis of Environmental Consequences

In this chapter Alternatives No Action, A, B, and C are contrasted and compared based on their environmental consequences, and the Reasonable (preferred) Alternative is identified.

4.1 Analytic Method

Through field visits, literature review and consultation with key informants the environmental consequences of the considered alternatives were identified. The Assessment Team qualified these impacts based on their direction (negative, positive), location (local, in a specified zone, or regional), magnitude [direct, indirect; no impact (0), insignificant impact (1), significant impact (2), irreversible negative impact (3)] and duration (short, medium or long term). (See Table 4.2 .) From this assessment, a qualitative evaluation of the four alternatives is developed and a Reasonable (preferred) alternative is selected.

4.2 Environmental Consequences by Alternative

4.2.1 Alternative No Action: No Intervention in Traditional Livestock Management

Taking into account the description of the activities carried out under the traditional livestock management scenario, the following environmental consequences are identified. The agricultural frontier continues to expand and convert primary and secondary forests to under productive pastures. Soils are compacted due to overgrazing and water bodies and sources are contaminated. Erosion along riparian zones, arroyos, and on slopes expands and becomes increasingly difficult to recuperate naturally. Unsanitary conditions and clandestine slaughterhouses increase the risk of transmission of diseases to humans or other animals and adds to water pollution and soil contamination. These environmental factors contribute to a decreased rate of return on milk and meat products and ultimately the farmers' ability to support their livestock production initiative and their families.

4.2.2 Alternative A: Recuperation of Soils and Forest Management

Alternative A would increase ground cover, decrease erosion, slow deforestation, and decrease water pollution by recuperating pastures, improving forest management, and reforesting within pastures. However, Alternative A does not fully address the environmental and socioeconomic issues associated with livestock production.

Although this alternative addresses livestock management strategies through herd rotation and improved pastures, these practices are only one piece of the puzzle that intensifies cattle production on limited pasturelands. From a production perspective, it is essential to address sanitation, livestock nutrition, and inbreeding issues if milk and meat production are to continue to provide a viable economic alternative to beneficiaries. From an environmental perspective, sanitation practices that manage waste and maintain healthy cows through veterinary extension reduce potential impacts on water quality and human health. Additionally, in principle, healthy, productive cows will produce more on less forage, in the end decreasing pressures to convert primary forest.

Long-term planning and continued support through extension and training is essential to institutionalizing silvopastoral practices into the lives of Chapare farmers. The EA team visited one farm that had received pasture rehabilitation and improvement support approximately five years earlier. Those pastures are now compacted and invaded by natural grasses again because

of poor herd management practices, and the farmer had not received follow-up technical assistance. Alternative A provides punctual interventions on the farm, but aside from forest management planning, does not provide a clear picture of how to develop comprehensive and sustainable silvopastoral production systems.

Alternative A also asks the farmer to invest up-front in forestry-related activities that will give a return on his/her investment mostly in the medium- and long-term. The low compliance of farmers with the mitigation measures during the experimental phase of the Silvopastoral Project (2001-2003) suggests that planting live fences, protecting water sources, and reforesting are low priorities in their daily lives. Without more immediate returns on their investment, beneficiaries will be less willing to participate in the project and will continue their destructive traditional rangeland management practices. This process also does not adequately address Alternative Development's objective of improving incomes among ex –coca growers. Although a viable environmental alternative, it is the Team's assessment that it incompletely addresses project objectives and livestock management and production in the tropics.

4.2.3 Alternative B: Animal Productivity

Based on anecdotal evidence, during the Silvopastoral Experimental, the expectations this program created caused some producers within the BUM to clear forest lands to establish pastures in hope of receiving subsidized cattle. During the experiment, 266 beneficiaries recieved approximately 1,802 head between 2001and 2003. (Gutierrez, 2003.) Although there is no hard data on farm level changes in land use during that time, the Team determined that forest cover, especially secondary growth, was impacted by the implementation of the cattle distribution process. Forest conversion results in loss of biodiversity as well as water pollution, changes in the landscape, and soil erosion.

Another lesson learned from the Silvopastoral Experiment concerns the level of implementation of the mitigation measures. A majority of participating farmers did not comply with the contract they had signed that required them to completely carry out defined migitation measures. During the Silvopastoral Experiment the core of the silvopastoral practices such as live fences, watering tanks, and reforestation with multi-purpose trees were defined by the mitigation measures outlined in the project *Dictamenes*. Follow-up and monitoring of these mitigation measures was inadequate and continued water pollution, soil erosion, and loss of biodiversity resulted. Implementation of silvopastoral and livestock production activities in such a piecemeal unintegrated fashion can also result in a low level of awareness on the part of the beneficiaries of connections between healthy ecological systems and improved production.

Due to its focus on cattle production over environmental management, the social and environmental impacts resulting from cattle distribution, lack of an effective follow-up and monitoring plan of the implemented activities, and an inadequate strategy to address biodiversity values within the larger ecological landscape, the Team does not support Alternative B as the preferred alternative.

4.2.4 Alternative C: Comprehensive Livestock, Pasture and Environmental Management

The potential environmental consequences associated with this alternative are:
Indirect and regional –

1) conversion of secondary and primary forest in anticipation of receiving the cattle production benefits of participating in the program
2) silvopastoral projects prove to be socioeconomically unsustainable, motivating farmers to revert to traditional management practices,

or direct and localized –

1) superficial and subsurface water pollution from run-off of concentrated wastes in and around infrastructure,
2) soil erosion from plowing with heavy machinery,
3) changes in vegetation composition.

The comprehensiveness of Alternative C also requires a significant level of organization and inter-institutional cooperation from participating actors that, if not well-developed and implemented, could result in the same impacts as experienced during the Silvopastoral Experiment - continued degradation of rivers, streams, habitats, and forests for low compliance with mitigation measures. The potential negative impacts of Alternative C are not that different from those identified in Alternatives A and B. However, Alternative C incorporates rational, science-based planning activities that produce positive impacts, and bases project implementation strategies on the lessons learned from the previous two years of the Silvopastoral Experiment. Additionally, Alternative C's activities under Selection and Organization of Beneficiaries, and Training, Extension and Monitoring, incorporate environmental, socioeconomic and socio-cultural dimensions of livestock management into project planning, aspects that were missing in Alternatives A and B.

Table 4.2: Summary of Negative and Positive Environmental Impacts by Alternative with Location, Magnitude and Duration

Components	Alternative A		Alternative B		Alternative C		No Action	
	Postive	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**
Selection and Organization of Beneficiaries	Decrease soil compaction due to prioritization of degraded pastures (L,2/I,M)	Increase land conversion through promotion of livestock on sensitive lands (Z,3/I,l)	Increased acceptance of livestock and pasture management (Z,1/D,m/l)	Deforestation caused by anticipation of project benefits (Z,3/I,l)	Decrease soil compaction due to prioritization of degraded pastures and sensitive lands (L,2/I,M) Improve environmental conditions for gender focus (L,1/D,l)	Deforestation caused by anticipation of project benefits (Z,3/I,l)		Increased deforestation, water pollution and soil erosion from indiscriminate conversion of lands for livestock production (Z,3/D,L)
Management Plans	Sustained yield of wood (L,2/D,l) Decrease impacts on biodiversity (R,2/I,l)	Soil compaction from extraction machinery (L,2/D,c)	Not included	Indiscriminate extraction of local wood sources (Z,3/D,m/l) Water pollution and vegetation composition changes due to segregation of silvicultural and pastoral activities (L, 2/I,m/l)	Sustained yield of wood (L,2/D,l) Rational exploitation of farm resources (L,2/D,l) Decrease impacts on biodiversity (R,2/I,l)	Changes in vegetation composition (L,2/I,l)		Indiscriminate extraction of local wood sources (Z,3,m/l)
Pasture Rehabilitation and Management	Increase ground cover (L,2/D,m) Reverse and diminish soil compaction (L,2/D,m)	Localized soil erosion from plowing (L,2/D,c) Changes in vegetation composition (L,2/D,l)	Increase ground cover (L,2/D,m) Reverse and diminish soil compaction (L,2/D,m)	Localized soil erosion from plowing (L,2/D,c) Changes in vegetation composition (L,2/D,l)	Increase ground cover (L,2/D,m) Reverse and diminish soil compaction (L,2/D,m)	Localized soil erosion from plowing (L,2/D,c) Changes in vegetation composition (L,2/D,l)		Soil compaction from overgrazing (L,2/D,l)

L - Local, Z - Zone, R - Regional; 0, no impact, 1, insignificant, 2, significant, 3, irreversible; I-Indirect, D-Direct; c-short-term, m-medium-term, l-long-term.

Table 4.2 Continued: Negative and Positive Environmental Impacts by Alternative

Components	Alternative A		Alternative B		Alternative C		No Action	
	Postive	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**
Establishment of Silvopastoral Systems	Increase long term timber sources (Z,1/I,l) Diminish grazing impacts on rivers & streams (L,2/D,m/l)		Increase long term timber sources (Z,1/I,l) Diminish grazing impacts on rivers and streams (L,2/D,m/l)	Changes in vegetation composition (L,2/D,m)	Increase long term timber sources (Z,1/I,l) Diminish grazing impacts on rivers and streams (L,2/D,m/l) Increase biodiversity values (Z,2/I,m/l)	Changes in vegetation composition (L,2/D,m)		Destruction of riparian vegetation (L, 2/D,l) Degradation of aquatic habitat (Z,2/D,l) Decrease biodiversity (Z,2/I,l) Decrease wood sources (L,2/I,l)
Infraestructure Construction and Improvement	No action	Diminished returns on milk production (L,2/I,l)	Decrease direct impacts on water sources (L,2/D,m) Increase quality of milk products (L,2/I,l)	Increased water pollution from run-off of concentrated waste (Z,2/D,c) Increase pressure on local & regional wood sources (Z,2/I,m)	Decrease direct impacts on water sources (L,2/D,m) Increase quality of milk products (L,2/I,l)	Increased water pollution from run-off of concentrated waste (Z,2/D,c) Increase pressure on local and regional wood sources (Z,2/I,m)		Decrease quality of milk products (L,2/I,l) Decrease health of cattle (L,2/I,l)

L - Local, Z - Zone, R - Regional; 0, no impact, 1, insignificant, 2, significant, 3, irreversible; I-Indirect, D-Direct; c-short-term, m-medium-term, l-long-term.

Table 4.2 Continued: Negative and Positive Environmental Consequences by Alternative

Components	Alternative A		Alternative B		Alternative C		No Action	
	Postive	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**
Livestock Management and Production		Maintain or diminish current levels of sanitation (L,2/I,l) Maintain or diminish current health of cattle (L,2/I,l)	Decrease land area required for production (L,2/I,m) Sanitary environment established (L,2/D,m) Increase family income (L,2/I,m)	Increased land use conversion on soils with limited capacity for cattle production (L,2/I,l) Changes in cultural relationships with cattle production (L,2/I,l)	Decrease land area required for production (L,2/I,m) Increase family income (L,1/I, c/m) Establish sanitary environment (L,2/D,c/m)	Changes in cultural relationships with cattle production (L,2/I,l)		Decrease genetic quality of livestock (L,3/I,l) Unsanitary conditions (L,2/I,l) Malnourishment of livestock (L,2/I,l)
Training, Extension and Monitoring	Increased awareness of pasture and forest manage-ment (R,2/D,m/l)		Increased awareness of pasture and livestock management (R,2/D,m/l)	Insufficient prioritization of environmental protection (Z,2/I,m)	Increased awareness of environment management of livestock and pastures in tropical ecosystem (R,2/D,m/l) Increased knowledge among field technicians of silvopastoral practices (R,2/D,m/l)		Not included	Traditional practices from environmental context of valleys and altiplano transferred to tropical ecosystem (Z,2/I,m)

L - Local, Z - Zone, R - Regional; 0, no impact, 1, insignificant, 2, significant, 3, irreversible; I-Indirect, D-Direct; c-short-term, m-medium-term, l-long-term.

4.3 Discussion of Principal Environmental Issues

The environmental consequences of the above alternatives differ mostly based on the presence or absence of project activities in livestock, pasture, and silvopastoral management. The alternatives share many of the consequences because the implementation of livestock, pasture and silvopastoral management is based on two basic assumptions: 1) intensification of production results in decreased deforestation, and 2) silvopastoral systems are economically viable. However, this assessment surfaces issues that bring into question these assumptions, arguing that continued deforestation and socioeconomic sustainability of cattle production are two of the principal challenges to this project and they are influenced by size and location of beneficiary farms. These issues are discussed below with the objective of introducing the need to locate and develop the scale of livestock, pasture, and silvopastoral management strategies based on a characterization of environmental and production zones in the Chapare. Impacts on habitat, biodiversity, and soil erosion are also addressed. The considered alternatives are reviewed based on their capacity to address these issues.

4.3.1 Deforestation and Expansion of the Agricultural Frontier

Deforestation in the Chapare has its roots in colonization and coca cultivation, an agricultural activity that quickly decimated tens of thousands of hectares of forest and polluted all the major waterways in the Tropics of Cochabamba. The influx of colonists to the Chapare in the 1980s for coca production increased deforestation as they laid claim to parcels by clearing the land and cultivating it for coca. However, with the compensation programs implemented by the GOB in the 1990's, coca farmers were given cows when they eradicated their coca crops. As the experience of the No Action alternative shows, traditional livestock management methods continue to expand the agricultural frontier as farmers seek out greener pastures for grazing and attempt to increase their herds. Silvopastoral systems have been established throughout the tropics of the world to slow down deforestation and mitigate the environmental effects of converting forests to pasture such as nutrient loss, water pollution, and biodiversity loss.

However, the hypothesis on which these systems have been established has not been validated. In fact, Vosti et al. (2001), Cattaneo (2001) and Roebling & Ruben (2001) show that, under various farm size and market scenarios, the continued deforestation of primary forest for pasture expansion is directly related to access to capital and labor. Kaimowitz (undated) concurs with these authors stating that better technology, such as that promoted in silvopastoral systems, can reduce deforestation in the short term; however, as capital accrues and labor becomes more abundant deforestation ensues. The good news is that Kaimowitz found that, on small farms in low population density areas with restrictions on land size, access to markets and capital, farmers were motivated to intensify livestock management and production, thus decreasing pressures on forest. The small farms north and south of Villa Tunari are representative of this scenario, especially regions to the north where topography restricts easy commercial access.

The experience of the experimental phase of the silvopastoral project suggests that promoting cattle production along with silvopastoralism can be a contradictory activity when the two activities are segregated during the implementation of the project. Promoting livestock management activities, especially ones that include subsidies for introducing improved cattle, can motivate farmers to focus on the short term and the social gain of receiving cheap cattle can precipitate further *chaqueo y quema* (slash-and-burn).

Anecdotal evidence suggests that as the experiment began promoting improved cattle breeds and silvopastoral systems in the Chapare, farmers were inspired to clear their land in anticipation of receiving project benefits. Additionally, few of the 180 farmers who participated in the experimental phase of the silvopastoral project completely implemented the silvicultural and mitigation measures that characterize a silvopastoral system. The *Evaluacion de Cierre* (DAI, 2003) of nine farms found that only 43% of the mitigation measures were completed.

Alternative B does not address the indirect impacts of land conversion from the promotion of infrastructure and cattle in the Chapare. It relies on its assumption that improving cattle production will intensify production, proving "less is more" and thus decreasing deforestation. Alternative A does not address sanitation and production needs directly but develops forest management plans for both the primary and secondary growth, and links agroforestry activities with pasture recuperation. In doing so, Alternative A ignores beneficial effects healthy cows can have both environmentally and socioeconomically. Alternative C incorporates the agroforestry and forest management planning activities of Alternative A and some of the livestock production activities of Alternative B. It does not distribute cattle to beneficiaries but establishes a system of incentives that links financing to the completion of farm planning, silvopastoral practices, and herd management training.

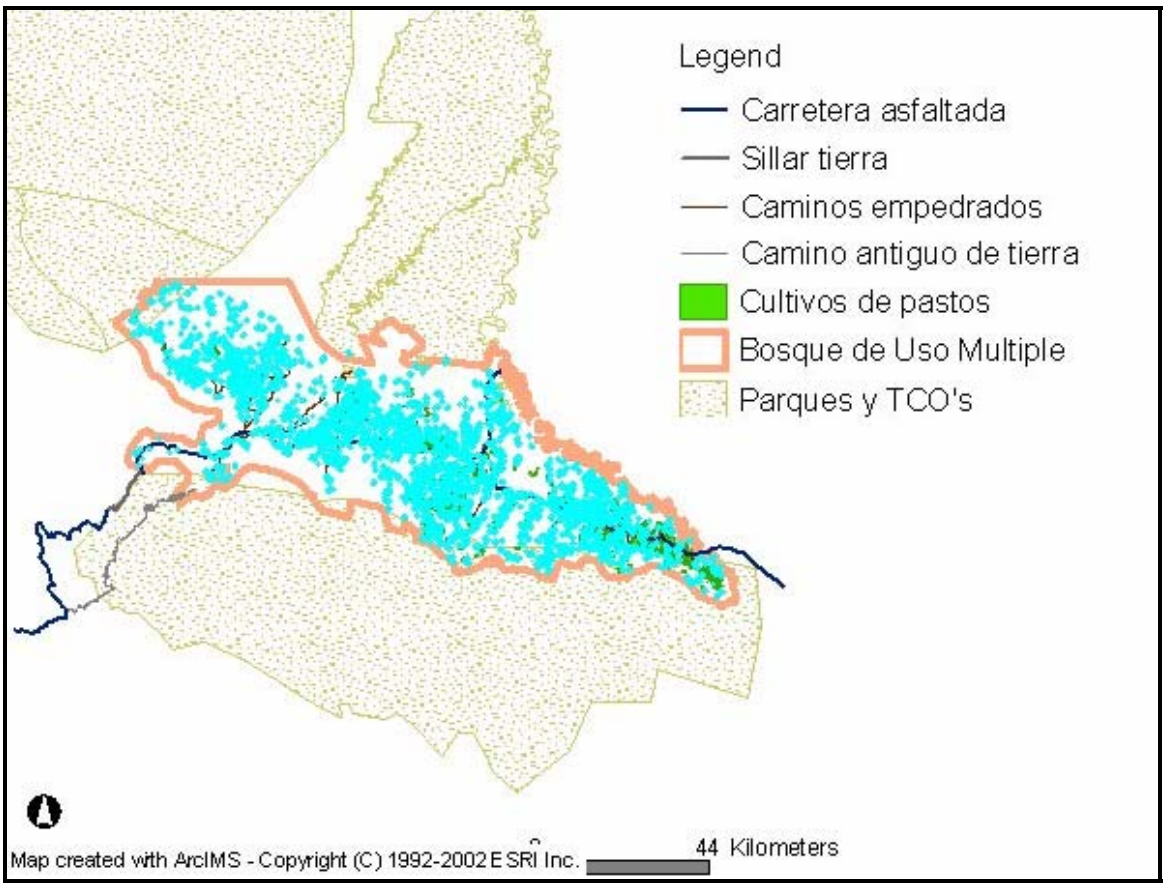
The expansion of the agricultural frontier and continued deforestation is inexorably linked to the socioeconomic sustainability of the silvopastoral system. This relationship creates a precarious balance between the level of project success and failure. A successful project potentially will attract more producers into cattle production activities, while an unsuccessful project can motivate farmers to continue their traditional management activities. For this reason, it is important to look at the possible social and economic consequences of this project.

4.3.2 Socioeconomic Sustainability

The results from the *"Evaluacion Tecnico Economica del Experimento Silvopastoril en el Tropico de Cochabamba"* (Guitierrez, 2003.) show that 87% of the silvopastoral farms were profitable; they experienced greater than 12% rate of return on the investment projected over a five-year period. Silvopastoral experiences in Central America have experienced a 20% increase in milk production yields just from planting shade trees in pastures. (Souza et.al, 2000, in Ibrahim, 2001.) From an economic perspective, silvopastoral systems are viable and valuable.

From a socioeconomic and cultural perspective, the motivations behind raising cattle in the Chapare are not purely commercial and far from industrial. The majority of cattle ranchers in the Chapare have never managed large herds, and their experiences come from their homelands in the valleys and altiplano of Bolivia where they raised a few milk cows for domestic consumption. This is the system they are pursuing in the Chapare and the impacts identified in the No Action alternative show that their collective knowledge about cattle production in a tropical ecosystem is not serving them well. Map 4.3.2.1 shows that the majority of pastures around the Chapare are less then 20 hectares only to the far east do pastures extend beyond this size.

Map 4.3.2.1: Pastures Less Than 20 Hectares (in blue) in the Chapare.



Socio-culturally, Chapare's small farmers appear to have a different relationship with their cows than farmers who manage large commercial operations. Cattle, to the small farmer, are like a bank account, and the number of head one has is directly related to their feelings of wealth and security. A small herd of improved breeds may increase milk production but is a higher risk than a larger herd of poorer-producing *mestizo*.

Cattle might also be more coveted by the farmer for sentimental reasons - one DAI technician said a farmer was reluctant to give up an under-productive cow because "it was a gift from my aunt". The manner in which these farmers handle their cows – approaching them and herding them on foot versus horseback, decorating them with pretty halters – suggests a relationship that goes beyond purely commercial motivations. Currently, little written information exists on the socio-cultural dimension of cattle production in the BUM.

Anecdotal evidence and statistical data suggest that investment in cows for most farmers in the Chapare is one of long term and low returns. More than 80% of ranching in the BUM is for both milk and meat production. Milk provides a daily source of income and food security; approximately 4 liters per cow - $5.00 per day. Milk prices, however, are fixed to a global market that provides little return on the investment. The importance of milk production to food security however is evident in DAI (2003) census data that reveal 78.6% of produced milk is consumed in the home.

The cow is also considered a farmer's savings account because, when necessary, it can be sold and butchered, earning the farmer on the average $200 per head. Economically, the process of *engorde* is a much more lucrative investment; however, currently only 14% of farmers in the Chapare dedicate their practice purely to meat production. (Sciaroni, 2001.) Because a majority of Chapare farmers prefer cows for *doble proposito* – milk and meat – they are often raising larger breeds such as Holsteins, Pardo Suizo, and Pitenguieras. Of the farms surveyed by Sciaroni (2001), 89% were raising Holstein, Pardo Suizo, Criollo and Jersey. (Appendix D characterizes the advantages and disadvantages of various breeds found within the Tropics of Cochabamba.)

A principal activity in the Silvopastoral Experiment was the distribution of purebred or improved breeds of cows to participating farmers with the purpose of improving production. Over 1800 head – bulls, heifers, cows, calfs and industrial cattle – were subsidized and distributed to 266 beneficiaries from 2001 to 2003. Mid-project evaluation results of the Experiment suggest certain local, mixed breeds produced as much milk as the purebreds. In fact, data suggest that the introduced cattle produced up to 6.1 kg/day while certain local cattle produced up to 8.7 kg/day. (See Tables 4.3.2.1,2.) These differences in production are dependent on other factors as well – livestock management practices, climate, pasture quality – however, it suggests that the rationale behind introducing purebreds needs to be re-evaluated within the context of the existing gene pool and environmental conditions of the Chapare. It is also unclear that the introduction of improved breeds significantly changed land use patterns on these farms, or if other factors such as forest management planning and pasture recuperation contributed.

Table 4.3.2.1: Daily milk production by type of producer and cow on experimental farms

Type of producer	Type of cow	Number of observations	Milk production kg/day (*)
Large	Introduced	130	3.97 (1.09)
	Local	97	3.63 (0.88)
Medium	Introduced	32	3.69 (0.95)
	Local	37	4.22 (1.42)
Small	Introduced	30	6.11 (0.93)
	Local	24	8.72 (2.76)

(*) Standard deviation

Table 4.3.2.2: Daily milk production by type and breed

Type of cattle	Breed	Number of observations	Average milk production kg/día (*)
Introduced	Gyr/ Pardo	8	5.00 (0.92)
	Gyr /Holando	85	4.68 (1.33)
	Pitangueiras	99	3.83 (1.2)
Local	Holando	24	8.47 (3.11)
	Gyr/Holando	6	3.39 (0.57)
	Mestizo /Holando	16	5.10 (1.8)
	Mestizo /Jersey	12	4.49 (1.48)
	Mestizo / Pardo	45	3.72 (0.66)
	Pardo	25	3.60 (0.70)
	Criollo	24	2.96 (0.67)
	Mestizo /Gyr	6	2.25 (0.98)

(*) Standard deviation

This brief discussion of the socioeconomic context of livestock production in the Chapare suggests that cattle production at a large commercial scale (approximately 40 head or more) is not culturally motivated, and further limited by farm size and soils. However, currently there does not exist a complete characterization of cattle production systems in the Chapare that defines economic or social thresholds between small-scale subsistence and large-scale commercial endeavours. The project should define the production capacity of the beneficiaries and develop appropriate farm management models and activities based on their production goals.

Alternative A does not directly support the economic development of cattle production in the Chapare, but it does address subsistence production issues by supporting crop diversification through forest management and silvicultural activities on small farms. Alternative B sufficiently addresses the economics of production, but fails to address the socio-cultural issues that limit the development of large-scale commercial livestock production in the Chapare. Alternative C proposes to look at the relationships between production goals, farm management, and the environment and develop cattle production activities based on that assessment.

4.3.3 Habitat and Biodiversity Loss, Water Pollution, Soil Erosion

Many of the environmental consequences identified in this assessment from livestock, pasture, and silvopastoral management in the Chapare are very localized to the farm or within the subwatershed or economic zone in which the farm is located. One consequence of the proposed activities is a change in vegetation composition. Forest management planning and silvopastoral activities are designed to change composition in a positive way, improving vegetation diversity, connectivity and rational extraction of wood resources. It is also noted that emphasizing enrichment and reforestation of commercially valuable trees and planting improved grasses and legumes such as kudzu (*Pueraria phaseloides*) creates compositional changes whose long-term impacts are still unknown.

The use of *Peuraria phaseloides*, tropical kudzu, in the tropics as a cover crop and nitrogen fixer has become common practice, especially on highly acidic and waterlogged soils. “It thrives in areas with an annual rainfall in excess of 1525 mm (60 in). Kudzu tolerates high water content in

the soil—even occasional waterlogging—but also grows well in the dry season, producing an abundance of pods and flowers. It is also tolerant of acid soil and shade." (ECHO, 1999.) The Assessment Team did not observe the invasion of this plant specie in the unmanaged riparian zones adjacent to pastures that had been planted with kudzu over five years ago. Bunch (1999-2003) emphasizes that *Peuraria phaseloides* should not be confused with peuraria lobata, the kudzu that has invaded the southeast of the United States.C-23's experience with kudzu shows that it dies out in 3-4 years and that under a grazed environment tropical kudzu is not a pest.

Pasture rehabilitation and infrastructure improvement activities stand to impart direct, local, and short-term impacts on water quality and the soils. For this reason, Alternatives A, B, and C incorporate various best management practices in the implementation of the proposed activities. The difference in these practices between alternatives is based on the presence or absence of the activity itself. However, currently there is no consolidated guide to the BMPs; practices have been developed by various institutions but are not well known or shared among the various technicians (i.e.; veterinarians, agricultural engineers, and foresters) who work in the field with the farmers.

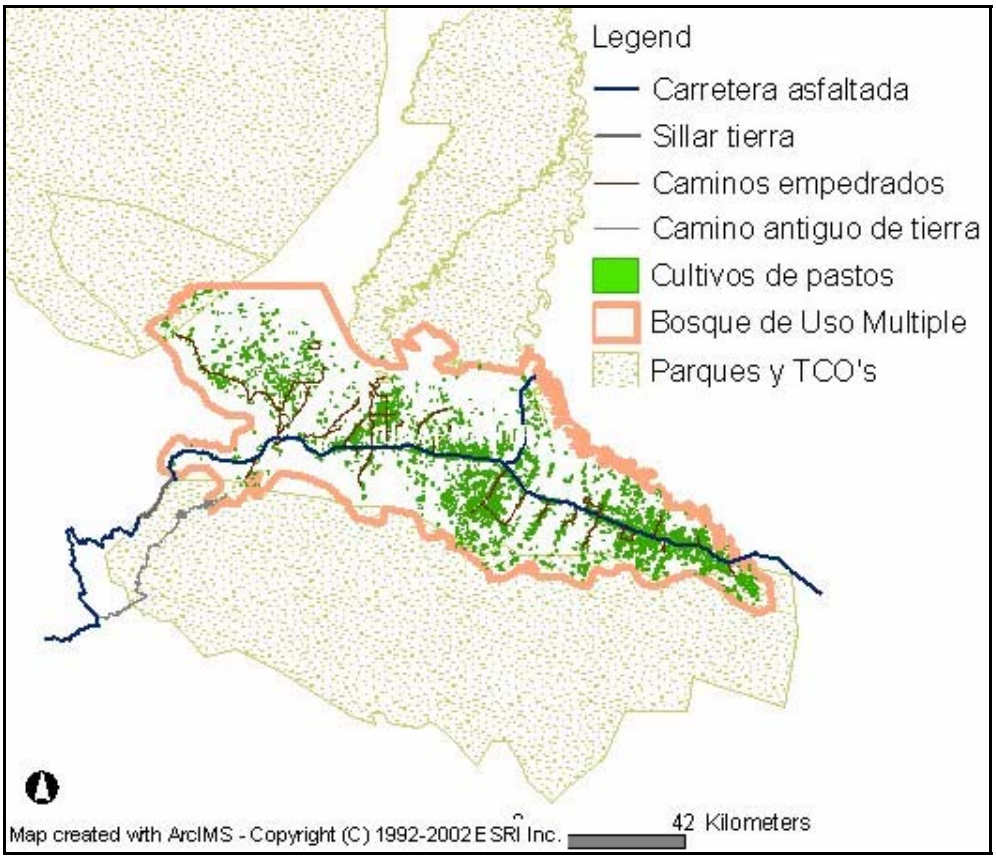
4.3.3 Localization of Silvopastoral Strategies

Due to various compounding variables, a more complete analysis of the appropriateness of proposed livestock, pasture, and silvopastoral management activities in geographic regions of the Chapare is necessary. From this environmental assessment – a cursory look at the possible zoning of project activities – it is easy to identify the physical, climatic, land size, demographic, and resource factors that define levels of production and environmental impacts of a silvopasotoral project.

As mentioned earlier, geographically the Chapare is situated between two protected areas and TCOs. The two national parks – Carrasco and Isiboro Secure – are already experiencing expansion into their borders by colonists. (Map 4.3.3.1) These regions also present the highest precipitation rates and topographic challenges. In general, Chapare farmers must contend with highly acidic soils, moderate to low drainage, and high aluminium content. Although soils are not saturated for long periods of time in the southern regions along the borders of TCOs, Map 4.3.3.2, shows that the best-drained soils are found to the north in the steep topography of Carrasco National Park.

Our assessment also shows that farm size increases from west to east, and livestock production relationships are partially defined by pasture size as well as access to markets. The western reaches of the Chapare also present the most exploited forests; fewer commercial wood species are present on farms. It is important for the project to calculate the threshold at which a farm is a commercial versus a subsistence operation based on total pasture size, and to take into account the availability of marketable natural resources on each farm when designing project strategies.

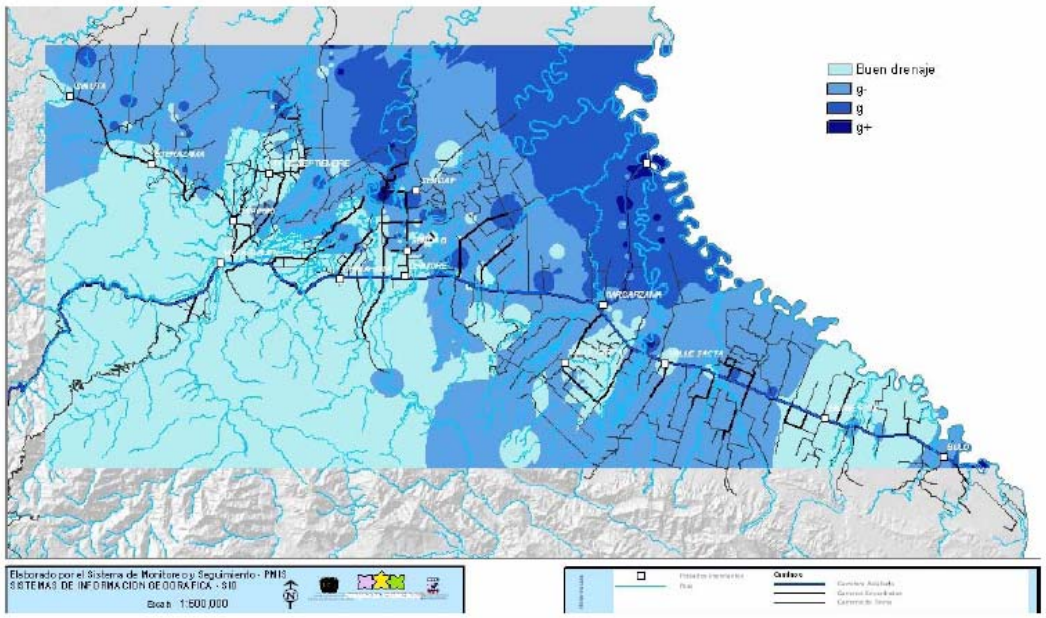
Map 4.3.3.1: Pastures Within or Adjacent to Protected Areas and TCOs.



It is also important to note that population growth rates are significantly higher east of Villa Tunari, around Puerto Villaroel and Chimore. The origin of these migrants is unclear but one indirect impact from these varying population dynamics can be seen in the amount of land dedicated to pastures between Chimore and Bulo Bulo in the east compared to that in the northern and southern reaches of Villa Tunari.

Kernan (1998) points out the "high agronomic risk" farmers face in the Chapare due to the infertile soils and heavy rainfall. He quotes both McCaffrey and Tosi who concur that the bioclimates and the soils are not suitable for traditional agriculture. McCaffrey identifies two classes of alternatives for development in the Chapare: "One is to modify and improve the existing small farm system. The other is to replace the existing system with a large-scale industrial system." (Kernan, 2001.) The eastern regions of the Chapare may be more suitable for large-scale sivlopastoral systems while the small farm systems of the western regions should be fortified and diversified.

Map 4.3.3.2: Soils and Drainage in the Chapare. (Ferrufino, 2003.)



Mapa 6. Características de drenaje de suelos del TC definidas por el método FCC. El modificador **g-** indica condiciones de saturación de agua en el suelo por muy corto tiempo, que no llegan a las capas superficiales. El modificador **g** indica condiciones de saturación por períodos largos en las capas profundas y saturación intermitente en las capas superiores. El modificador **g+** indica condiciones de saturación por períodos largos en todas las capas hasta la superficie.

Comparing soil limitations with park boundaries and farm size characteristics, it becomes clear that although the whole Chapare would benefit from developing silvopastoral farms, the project first needs to focus its resources on sensitive lands and along protected area borders. It is here silvopastoral systems may prove to be the most environmentally and economically valuable. Additionally, from this preliminary assessment it is evident that livestock, pasture, and silvopastoral strategies need to take into account farm size, production goals and limitations, and environmental factors before providing technical assistance to potential beneficiaries.

The literature on silvopastoral systems underscores the adaptability of these production systems to varying environmental and socioeconomic contexts. Murgueitio R. characterizes five agroforestry systems currently in use in Colombia;

1. Silvopastoral systems in extensive livestock ranches
2. Forest plantations with grazing livestock
3. Live fences, wind breaks, hedges, biological corridors, and shade trees for livestock
4. Silvopastoral systems with exploitation of a managed succession of vegetation
5. New systems for intensive ranching and other livestock such as: silvopastoral systems with high density forests, cutting grass, protein banks, and intercropping and stratification of multiple-use trees.

Costa Rica provides examples of ranchers who have integrated citrus production into their silvopastoral systems along with ecotourism development. (Benavides, 1994;

Ibrahim et al, 1998 in Ibrahim, 2001.) From a landscape perspective, the Chapare presents zones along the borders of the surrounding protected areas and within the region south and north of Villa Tunari where cattle production should be limited, while the silvicultural elements of silvopastoral systems along with other agroforestry practices can be promoted. However, it is important for this project to design silvopastoral strategies based on a thorough understanding of the above-mentioned socio-cultural characteristics of its potential beneficiaries, their production goals, and the biophysical limitations of their land, before implementing pasture, livestock and silvopastoral management activities.

The activities proposed in Alternatives A and B assume a uniform set of production goals and environmental characteristics throughout the Chapare, applying a relatively uniform set of livestock and silvopastoral interventions across climatic, production, and land use regimes. Alternative C requires identification of beneficiaries and farm management planning that analyzes biophysical limitations, ecological integrity, production goals, and socio-cultural factors. .

Alternative C – Preferred Alternative

Selection and Organization of Beneficiaries
- Beneficiary prioritization and selection based on ecological and production criteria

Development of Management Plans
- Elaborate forest management plans integrated into comprehensive farm plans

Pasture Recuperation and Management
- Recuperacton of compacted pastures
- Herd rotation
- Pasture division

Establish Silvopastoral Systems
- Live fences; multi-purpose trees
- Secondary forest enrichment
- Fence riparian zones; protect water sources
- Forage banks

Infrastructure Establishment and Improvement
- Milking facilities
- Corrals
- Water systems; water tanks
- Salt licks
- Manure management

Cattle Production and Management
- Herd stratification
- Sanitation and nutrition
- Protein banks
- No distribution of improved breeds

Training
- Extension and training for farmers and technicians
- Demonstration farms
- Mass communication
- Testing/adaptative management

4.4 Recommendation of the Preferred Alternative

It is the EA Team's assessment that Alternative C and its activities reasonably address the identified environmental issues while adequately supporting project objectives. With a logical and integrated progression of farm and forest management planning, pasture recuperation, implementation of silvopastoral practices, and livestock production support, negative consequences can be mitigated or avoided altogether, as outlined in the following chapter. (See also Appendix G.)

5. Mitigation Measures

The development and implementation of Alternative C will require the following mitigation measures to remain in compliance with FAA sections 118 and 119 and address the predicted environmental consequences of promoting livestock, pasture, and silvopastoral management in the Chapare.

Below, measures are presented by the environmental issues they address (in the margin to the left). The first group of mitigation measures (Group I: Established Best Management Practices) present measures that the project has already taken into account, and are understood by project technicians as being inherent to silvopastoral practices proposed under livestock, pasture and silvopastoral management. These may be best defined as Best Management Practices and tend to be localized to a site-based level. [Currently, descriptions of these practices are dispersed among various publications and project documents and need to be organized into one manual. (See MM #14, Habitat, Biodiversity Loss and Water Pollution.)] There are no additional costs to these measures as they are integrated into project implementation.

The second group of mitigation measures (Group II: Alternative C Mitigation Measures as Additional Costs to Project) includes those identified by the Assessment Team as necessary to address the identified environmental consequences of the activities proposed in Alternative C (See Appendix A). They tend to reflect gaps and needs in planning, information, and regulations identified as important to the implementation of an environmentally sensitive silvopastoral project but absent from current activities, or those proposed in Alternatives A and B. These measures carry additional costs and are reflected in the mitigation measures budget. Recommendations listed at the end of this section build off the Group II Mitigation Measures for Alternative C.

5.1 Group I: Established Best Management Practices

Increased Pressure over Wood Sources and Forests	**Justification:** Supporting infrastructure development and forestry activities can increase pressure on already overly exploited wood sources, especially in the western regions of the Chapare where few commercially viable species are present. Additionally, livestock can impart impacts on forests and wood sources if not well-managed. **Mitigation Measures:** 1) Identify and preserve nurse (seed) trees in forest management plans. 2) Reforest/plant commercially valuable trees adapted to the climate and topography of the farm, ie.; Tejeyeque, Trompillo, Verdolago, and Laurel). 3) Develop secondary growth management plans that support natural regeneration and succession into primary growth. 4) Establish a logical implementation process of the silvopastoral activities that will favor a high survival rate of planted seedlings; this may require a succession of agroforestry to silvopastoral activities or additional fencing. 5) Wood materials will be bought from GOB (Superintendencia Forestal) -certified forest management plans.

Socioeconomic Sustainability	**Justification:** Current production systems in the Chapare are critically limited by the biophysical and environmental characteristics of this tropical wet region. Sustainable yield of livestock and commercial timber necessarily is dependent on planning that calculates future production based on the environmental and economic realities of the region. **Mitigation Measures:** 6) Develop forest management plans for sustained yield. 7) Calculate livestock carrying capacity as an integral component of the farm management plan based on variables such as soil capacity, topography, access to market, and long-term production goals.
Habitat and Biodiversity Loss, Water Pollution, Soil Erosion	**Justification:** Silvopastoral activities are designed to address the negative effects of livestock production on forested lands. It is important to explicitly require the implementation of certain practices that support biodiversity, protect water sources, and conserve soils. **Mitigation Measures:** 8) Within the farm and forest management plans, the farmers and technicians will identify the activities that will be implemented to maintain or improve connectivity and biodiversity. 9) Associate tree species of different strata in plantation-style reforestations. 10) Fence cattle out of wetlands and severely eroded arroyos except at necessary crossings. Establish limited access points to rivers for drinking. 11) Revegetate and establish erosion control structures in severely eroded areas with low potential of recuperating naturally. 12) Plowing will occur during the dry season and follow the contour of the land. The land will be leveled after plowing to reduce soil erosion. When natural drainages have been disturbed, establish new ones designed to reduce soil erosion on recently plowed land. 13) The project will respect the ecological services norms of Bolivian Forestry Law 1700 and establish buffer zones around arroyos, rivers, and wetlands. 14) When using dolomite fertilizer, the project will comply with established USAID fertilizer regulations or not surpass the recommended dose of 1,000 kg/ha, whichever is stricter. 15) Pasture divisions will be designed with the calculated carrying capacity in mind and sufficient periods of occupation and rest to maintain a healthy groundcover in the long term. (Appendix F.) 16) Infrastructure will be sited greater than 50 m from superficial waters and water sources (in compliance with Bolivian Forestry Law 1700) and vegetative buffer zones will be planted between the infrastructure and body of water when infrastructures are located upslope from them. 17) The project will train farmers in waste management strategies to decrease the impacts of concentrated wastes in and around production infrastructures.

Livestock (and Human) Sanitation and Health	**Justification:** Livestock management is shared between the men and women of beneficiary families. Improving the sanitary practices of both parties will improve overall conditions, especially for the women who tend to have more direct contact with the cattle. Project experience and scoping results point out the necessity to continue reaching out to women farmers to effectively improve livestock management. **Mitigation Measures:** 18) The project will actively support the inclusion of women and other family members in all training activities. 19) The project will respect the norms of Bolivian Law 1333 and GOB health regulations when designing and constructing infrastructure. 20) Train farmers, especially women, in sanitation and vaccination planning, control of fiebre aftosa (foot-and-mouth disease), record keeping of production and reproduction, and other herd management and control methods.

5.2 Group II: Alternative C Mitigation Measures as Additional Costs to Project

Deforestation Expansion of Agricultural Frontier	**Justification:** It is evident from literature around Latin America that access to capital provides incentives to expand cattle production. In order to minimize the risk of expanding the agricultural frontier over primary forest from the technical and material support the project will provide, the following mitigations will be enacted: **Mitigation Measures:** 1) Define a compliance strategy based on the norms of Bolivian Protected Area laws and indigenous land regulations before implementing project activities within protected areas or TCOs. 2) Develop a review process that conditions access to US AID - supported credit or financing for infrastructure development and plant material on the completion of forest management plans. Financing levels will be based on the calculated carrying capacity of existing pastureland of each farm. 3) Do not distribute live cattle to beneficiaries, nor provide financing or credit for the purchase of cattle in the immediate or medium term. Improve the gene pool with existing improved stock and artificial insemination. If the project deems it necessary to distribute improved breeds in the future the activity will be proposed to the USAID/Bolivia Mission Environmental Officer for further review and approval, based on the following studies; • The project will document the results of distribution of improved breeds during the experimental phase (2001-2003). The study will measure survival rates of distributed cattle, their production, land conversation rates on recipient farms, and the acceptance by the farmer of the introduced animals, among other variables. (See Socioeconomic Sustainability, MM #1.) • A detailed study of the gene pool of the beneficiaries' herds with specific recommendations for breeds, numbers, and distribution. 4) Conduct a policy analysis of environmental management of livestock production. Identify the gaps in regulation and control and create a strategy to develop and strengthen incentives and regulation for silvopastoral management in the GOB context.

	5) Adapt project planning and implementation annually based on the findings and recommendations of a yearly technical and participatory evaluation of project activities. The evaluation will measure the degree to which silvopastoral activities have been carried out and finalized on the farm. Quantifiable indicators such as number of trees planted, survival rates for established trees, number of hectares planted in improved pasture, and carrying capacity should be measured. The evaluation should also incorporate findings from project monitoring, such as water quality data, and technical validation activities. 6) Conduct a supplementary environmental assessment of small livestock production, such as sheep and goats, before distributing them through the project. 7) Do not select beneficiaries to participate in the project who are not already raising cattle. 8) Communicate – through the life of the project - to potential beneficiaries that farmers who deforest their lands are at risk of losing project benefits.
Socio-economic Sustainability	**Justification:** There exist significant regional variations within the Chapare between precipitation, soils and drainage, farm size, access to markets, and primary forest cover. Socioeconomic sustainability in the Chapare, where climatic and edaphic conditions will continue to limit production levels, is dependent on implementation of project strategies that take into account current production systems, their management practices, and the socio-cultural context within which livestock production happens. **Mitigation Measure:** 9) Develop project implementation strategies based on a characterization of existing systems of production within the Chapare, such as: commercial, subsistence, dual-purpose, and engorde farms. This study will calculate the threshold at which a farm is a commercial versus subsistence operation based on total pasture size, and analyze the socio-cultural, economic and management (decision-making, resource planning and technical capacity) factors that define these systems of production, and geographically locate them within the project area. • The project will also study the results of distribution of improved breeds during the experimental phase (2001-2003) measuring survival rates of distributed cattle, land conservation rates, compliance with established mitigation measures, and the acceptance by the farmer of the introduced animals, as well as assess farmer's current accessibility to stud services of improved breeds, among other variables, and incorporate these findings in the design of implementation strategies.
Habitat and Biodiversity Loss, Water Pollution, Soil Erosion	**Justification:** Although the silvopastoral activities implemented during the Experiment included various measures to decrease impacts over biodiversity, water, and soils, they were often incompletely and haphazardly developed. Additionally, beneficiaries were chosen based on production criteria, such as pasture size requirements while environmental criteria were not taken into account. Silvopastoral practices, although applicable all over the Chapare, could be especially beneficial - socially, environmentally, and economically - on farms with existing limitations such as degraded pastures and saturated soils. Biodiveristy values, both at farm and landscape levels, have not been well-integrated into project planning.

	Mitigation Measures: 10) Prioritize potential beneficiaries, during project planning, based on the following criteria: location of the farm in biological corridors, presence of degraded pastures, proximity to protected areas, and location on sensitive lands which are defined as slopes greater than 15% , poorly drained soils, and within floodplains. 11) Contract a biologist, familiar with the ecological conditions of the Chapare, to develop a simple habitat and biodiversity monitoring program, appropriate for implementation by farmers and technicians in conjunction with local extension services. The biologist will determine appropriate indicator species for monitoring change in flora and fauna composition and in ecological dynamics of the ecosystems affected at a farm level by project activities. 12) Condition disbursement of USAID supported credit and financing for fencing on the completion of pasture and herd management training. 13) Contract a hydrologist to develop a sub-surface water-monitoring program in which he/she will define the methodology, frequency of measurement, and test sites appropriate to the hydrological context of the Chapare and the proposed well-drilling activities. 14) Write a best management practices manual of silvopastoral practices and localized mitigation measures based on existing literature from Bolivian institutions and other sites around Latin America with similar environmental conditions.
Integration of Forest and Environmental Management with Livestock Production	**Justification:** The Assessment Team found that insufficient follow-up and coordination between the various technicians working in the project resulted in poor implementation of mitigation measures. Participants responses during the Entre Rios scoping meeting identified beneficiaries' concerns with both environmental and production factors, and their interelatedness. Project training and extension need to respond to these needs through a more integrated and participatory approach that accompanies the farmer through decision-making processes and provides solid technical solutions. **Mitigation Measures:** 15) Exchange technical knowledge and experience between the representative disciplines of CONCADE technicians and institutions through thematic workshops and the formation of multidisciplinary teams of extensionists. 16) Establish up to three demonstration farms for each identified production system and precipitation zone in the Chapare that can be used for training, promotion, and research in silvopastoral systems and management. 17) Conduct training with beneficiaries in the field – on the farm – developing "field schools" in which farmers learn new technologies by doing them. 18) Establish an early warning system that monitors behaviors and management activities and identifies potential areas of supplementary training or extension support. 19) Carry out participatory research activities with project beneficiaries that test and adapt silvopastoral and livestock production (nutrition, management, sanitation, reproduction) technologies to the biophysical and climatic reality of the Chapare.

5.3 Recommendations for Group II, Alternative C Mitigation Measures

Deforestation, Expansion of Agricultural Frontier

1) Develop *Planes de Ordenamiento Predial* for each beneficiary farm.
2) Farm management plans should include the following elements: soil surveys, forest management plan, pasture management, livestock management, infrastructure development, production goals, carrying capacity, and environmental management of farm natural resources and its location within a regional economic and ecosystem context.
3) Research the rotation of successional stages of vegetation – pastures to secondary growth to primary growth - on farms in the Chapare.
4) Improve genetic stock of beneficiaries' herds using existing improved breeds or through artificial insemination.

Socioeconomic Sustainability

5) In subsistence livestock production systems introduce or support alternative production activities such as agroforestry, humus, or camu camu.
6) Actively motivate participation of women in decision-making processes.
7) Establish "grass banks" on under-utilized pastures with association members that can generate additional income and also provide alternative pastures to farmers while their pastures recuperate.
8) Each participating second-level organization should conduct a census of the cattle owned by their members.
9) Develop a market between ranchers and local industries for packing plant by-products.
10) Develop commercialization and marketing support systems for the various production systems identified in the Chapare

Habitat and Biodiversity Loss, Water Pollution, Soil Erosion

11) Identify and select beneficiaries based on the criteria in MM #10 within a watershed context.
12) Design and locate live fences and multipurpose trees to maintain or improve connectivity and biodiversity.
13) Use non-wood or recycled materials for infrastructure improvements.
14) Design the farm to maintain water tanks and salt licks in one place.
15) Coordinate implementation of project activities based on the timing and availability of plant materials.
16) Monitoring programs should incorporate local young adults in data collection and analysis.
17) Collect, catalog, and periodically update all existing ecological and biological research on the Chapare and make this research available to CONCADE technicians.

Integration of Forest and Environmental Management with Livestock Production

18) Test the hypothesis that the message "less is more" can protect forests through silvopastoral systems.
19) Link training and extension with the development of management plans.
20) Suggested research topics for participatory researchers: livestock production impacts on biodiverisity within silvopastoral systems; impacts on wetlands in silvopastoral systems.
21) Include silvopastoral themes in existing communications strategies.

5.4 Mitigation Measures Budget

Table 5.4.1: Mitigation Measures, Estimated Costs and Responsible Institutions *(Italicized costs are dependent on implementation of activity.)*

Environmental Issue:	Mitigation Measures	Estimated Costs/Responsible Institution	
		Cost	**Responsible party**
Deforestation, expansion of agricultural frontier.	1. Define a compliance strategy based on the norms of Bolivian Protected Area laws and with indigenous land regulations before implementing project activities within protected areas or TCOs.	1. No additional costs	DAI/C-23
	2. Develop a review process that conditions access to US AID supported credit or financing for infrastructure development and plant material on the completion of forest management plans. Financing levels will be based on the calculated carrying capacity of existing pastureland of each farm.	2. One month internal consultancy; $2,000	DAI/C-23
	3. Do not distribute live cattle to beneficiaries, nor provide financing or credit for the purchase of cattle in the immediate or medium term. Improve the gene pool with existing improved stock and artificial insemination. If the project deems it necessary to distribute improved breeds in the future the activity will be proposed to the USAID/Bolivia Mission Environmental Officer for further review and approval, based on the following studies; a. The project will document the results of distribution of improved breeds during the experimental phase (2001-2003); the study will measure survival rates of distributed cattle, their production, land conversation rates on recipient farms, and the acceptance by the farmer of the introduced animals, among other variables. (See Socioeconomic Sustainability, MM #1.) b. A detailed study of the gene pool of the beneficiaries' herds with specific recommendations for breeds, numbers and distribution	3. No initial additional costs with existing improved stock. Artificial insemination, $1500/600 cows. Gene pool study, $100,000	DAI/C-23 *IBTA*
	4. Conduct a policy analysis of environmental management of livestock production. Identify the gaps in regulation and control and create a strategy to develop and strengthen incentives and regulation for silvopastoral management in the GOB context.	4. One month external consultant, $25,000	DAI
	5. Adapt project planning and implementation annually based on the findings and recommendations of a yearly technical and participatory evaluation of project activities. The evaluation will measure the degree to which silvopastoral activities have been carried out and finalized on the farm. Quantifiable indicators such as number of trees planted, survival rates for established trees, number of hectares planted in improved pasture, and carrying capacity should be measured. The evaluation should also incorporate findings from project monitoring, such as water quality data, and technical validation activities.	5. Team of external consultants in participatory evaluation and silvopastoral manage-ment, $25,000/year	DAI/C-23
	6. Conduct a supplementary environmental assessment of small livestock production, such as sheep and goats, before distributing them through the project.	*6. Supplementary EA: included in monitoring budget*	DAI

Environmental Issue:	Mitigation Measures	Estimated Costs/Responsible Institution	
		Cost	**Responsible party**
	7. Do not select beneficiaries to participate in the project who are not already raising cattle.	7. No additional costs	C-23
	8. Communicate – through the life of the project - to potential beneficiaries that farmers who deforest their lands are at risk of losing project benefits.	8. No additional costs	DAI/C-23

Table 5.4.1 Cont.: Mitigation Measures, Estimated Costs, and Responsible Institutions Cont.

Environmental Issue:	Mitigation Measures	Estimated Costs/Responsible Institution	
		Cost	**Responsible party**
Socioeconomic sustainability	1. Develop project implementation strategies based on a characterization of existing systems of production within the Chapare, such as; commercial, subsistence, dual purpose, and "engorde" farms. This study will calculate the threshold at which a farm is a commercial versus subsistence operation based on total pasture size and analyze the socio-cultural, economic and management factors that define these systems of production and geographically locate them within the project area. The project will also study the results of distribution of improved breeds during the experimental phase (2001-2003) measuring survival rates of distributed cattle, land conversation rates, and the acceptance by the farmer of the introduced animals, as well as assess farmer's current accessibility to stud services of improved breeds, among other variables, and incorporate these findings in the design of implementation strategies.	1. Two month consultancy: $30,000	DAI
Habitat and biodiversity loss, water pollution, soil erosion	1. Prioritize potential beneficiaries, during project planning, based on the following criteria: location of the farm in biological corridors, presence of degraded pastures, proximity to protected areas, and location on sensitive lands, defined as slopes greater than 15%, poorly drained soils, within floodplains.	1. No additional costs	DAI/C-23
	2. Contract a biologist, familiar with the ecological conditions of the Chapare, to develop a simple habitat and biodiversity monitoring program, appropriate for implementation by farmers & technicians in conjunction with local extension services; the biologist will determine appropriate indicator species for monitoring change in flora and fauna composition and in ecological dynamics of the ecosystems affected at a farm level by project activities.	2. Bolivian biologist: $16,000/year Equipment: $5,000	C-23
	3. Condition disbursement of US AID supported credit and financing for fencing on the	3. No additional cost	DAI

Environmental Issue:	Mitigation Measures	Estimated Costs/Responsible Institution	
		Cost	**Responsible party**
	completion of pasture and herd management training. 4. Contract a hydrologist to develop a subsurface water-monitoring program in which he/she will define the methodology, frequency of measurement and test sites appropriate to the hydrological context of the Chapare and the proposed well drilling activities. 5. Write a best management practices manual of silvopastoral practices and localized mitigation measures based on existing literature from Bolivian institutions and other sites around Latin America with similar environmental conditions.	4. Bolivian hydrologist: Two months/year, $2400/year 5. External Consultant: $15,000	C-23 DAI

Table 5.4.1 Cont.: Mitigation Measures, Estimated Costs, and Responsible Institutions Cont.

Environmental Issue:	Mitigation Measures	Estimated Costs/Responsible Institution	
		Cost	**Responsible party**
Integration of forest and environmental management with livestock production.	1. Exchange technical knowledge and experience between the representative disciplines of CONCADE technicians and institutions through thematic workshops and the formation of multidisciplinary teams of extensionists.	1. Three/two day workshops first quarter: $2,000 1-day workshop Quarterly: $330	DAI/C-23/IBTA
	2. Establish up to three demonstration farms for each identified production system and precipitation zone in the Chapare that can be used for training, promotion and research in silvopastoral systems and management.	2. Farm user fee: $100/year Silvopastoral materials and equipment: $4,000/year/farm	IBTA
	3. Conduct training with beneficiaries in the field – on the farm – developing "field schools" in which farmers learn new technologies by doing them. Include topics such as; sanitary and vaccination calendars; control of foot and mouth disease; herd productive and reproductive registers; and other methods of animal management and control.	3. No additional cost	DAI/C-23

Environmental Issue:	Mitigation Measures	Estimated Costs/Responsible Institution	
	4. Establish an early warning system that monitors behaviors and management activities and identifies potential areas of supplementary training or extension support.	4. No additional cost	DAI/ ProAg Training Unit
	5. Carry out participatory research activities with project beneficiaries that test and adapt silvopastoral and livestock production (nutrition, management, sanitation, reproduction) technologies to the biophysical and climatic reality of the Chapare.	5. Bolivian participatory research specialist: $16,000/year Compensation of participants: $5,000/year	DAI/Unidad de Capacitacion y Extension
		Total Mitigation Costs: Initial costs: $79,000. Annually: $ 63,320. *Activity dependent: $101,500*	

5.5 Mitigation Measures Monitoring Plan

The following tables describe monitoring activities that must be carried out to ensure that the Group II Alternative C mitigation measures have been fulfilled, and to demonstrate that these measures have effectively sustained or improved environmental conditions in the Chapare. Most of the monitoring activities will measure the *results* of mitigation, which is to say they will document the exact actions the project has carried out to comply with the EA. Other monitoring activities are specifically designed to determine the overall impact or *effectiveness* of the preferred alternative and mitigation measures.

Monitoring activities of the Group I Mitigations, or those identified as Best Management Practices, should be implemented through the DAI/Environmental Unit's *Evaluacion de Cierre* process. It is expected that this work will continue to be carried out on a farm-by-farm basis through the *Dicatamen Ambiental*, and that the mitigation and monitoring activities will be implemented upon approval of the EA. Documentation of these monitoring activities will be produced on an annual basis, at a minimum, and will be made available through the DAI/Environmental Unit. The proposed monitoring activities are categorized by mitigation measures specific to each identified environmental issue, and include the following:

Table 5.5.1 Monitoring Plan of Mitigation Measures

Env. Issue:	Mitigation Measures	Monitoring/Indicators	Est.Costs/Responsible
Deforestation, expansion of agricultural frontier.	1. Define a compliance strategy based on the norms of Bolivian Protected Area laws and with indigenous land regulations before implementing project activities within protected areas or TCOs. 2. Develop a review process that conditions access to US AID supported credit or financing for infrastructure development and plant material on the completion of forest management plans. Financing levels will be based on the calculated carrying capacity of existing pastureland of each farm. 3. Do not distribute live cattle to beneficiaries, nor provide financing or credit for the purchase of cattle in the immediate- or medium-term. Improve the gene pool with existing improved stock and artificial insemination. If the project deems it necessary to distribute improved breeds in the future, the activity will be proposed to the USAID/Bolivia Mission Environmental Officer for further review and approval, based on the following studies: a. The project will document the results of distribution of improved breeds during the experimental phase (2001-2003); the study will measure survival rates of distributed cattle, their production, land conservation rates on recipient farms, and the acceptance by the farmer of the introduced animals, among other variables. (See Socioeconomic Sustainability, MM #1.) b. A detailed study of the gene pool of the beneficiaries' herds with specific recommendations for breeds, numbers, and distribution 4. Conduct a policy analysis of environmental management of livestock production. Identify the gaps in regulation and control and create a strategy to develop and strengthen incentives and regulation for silvopastoral management in the GOB context. 5. Adapt project planning and implementation annually based on the findings and recommendations of a yearly technical and participatory evaluation of project activities. The evaluation will measure the degree to which silvopastoral activities have been carried out and finalized on the farm. Quantifiable indicators such as number of trees planted, survival rates for established trees, number of hectares planted in improved pasture, and carrying capacity should be measured. The evaluation should also incorporate findings from project monitoring, such as water quality data, and technical validation activities. 6. Conduct a supplementary environmental assessment of small livestock production, such as sheep and goats, before distributing them through the project.	1. Written compliance strategy signed by GOB protected area collaborators. 2. Periodic environmental review and ground-truthing processes incorporated into grant making and credit approval processes. 3. Policy incorporated into environmental review of *asignaciones* approval processes. • Completed proposal to USAID Mission Environmental Officer including results of a final report measuring and evaluating success of stock improvement activities during experimental phase and genetic needs assessment. 4. Completed policy report that fulfills the identified criteria. 5. Completion of yearly technical and participatory evaluation of project activities with recommendations for project improvements. 6. Completed SEA.	1. No additional costs/C-23. 2. No additional costs/C-23, DAI. 3. No additional costs/DAI • Study costs covered in Socioeconomic sustainability MM #1 and Deforestation, Expansion of Agricultural Frontier MM #3. 5. Policy report covered in mitigation measures budget. 6.Cost is covered under MM #8 of Deforestation and Expansion of Agricultural Frontier 7. $25,000/DAI

Environmental Issue:	Mitigation Measures	Monitoring/Indicators	Estimated Costs/ Responsible Party
Socioeconomic sustainability	1. Develop project implementation strategies based on a characterization of existing systems of production within the Chapare, such as: commercial, subsistence, dual purpose, and *engorde* farms. This study will calculate the threshold at which a farm is a commercial versus subsistence operation based on total pasture size; analyze the socio-cultural, economic and management factors that define these systems of production; and geographically locate them within the project area. The project will also study the results of distribution of improved breeds during the experimental phase (2001-2003); measuring survival rates of distributed cattle, land conservation rates, and the acceptance by the farmer of the introduced animals, as well as assess farmer's current accessibility to stud services of improved breeds, among other variables, and incorporate these findings into the design of implementation strategies.	1. Completed final report with GIS map that describes production systems in the Chapare and defines project strategies for each identified production system based on the required studies and analysis.	1. Cost covered in mitigation measures budget: Socioeconomic Sustainability, MM #1

Environmental Issue:	Mitigation Measures	Monitoring/Indicators	Estimated Costs/ Responsible Party
Habitat & biodiversity loss, water pollution, soil erosion	1. Prioritize beneficiaries, during project planning, based on the following criteria: location of the farm in biological corridors, presence of degraded pastures, proximity to protected areas, and location on sensitive lands - slopes greater than 15%, poorly drained soils, within floodplains. Prioritization will also take into account the findings of the production systems report as described in MM#1 of socioeconomic sustainability.	1. GIS maps that mark the location of farms in the Chapare on sensitive lands, along and within protected area and TCO boundaries, and with degraded pasture. Map updated on a yearly basis.	1. No additional costs/DAI, C-23
	2. Contract a biologist, familiar with the ecological conditions of the Chapare, to develop a simple habitat and biodiversity monitoring program, appropriate for implementation by farmers and technicians in conjunction with local extension services; the biologist will determine appropriate indicator species for monitoring change in flora and fauna composition and in ecological dynamics of the ecosystems affected at a farm level by project activities.	2. Before implementation of silvopastoral activities, develop a monitoring plan that includes rapid assessment indicators. • In first year, farm-based monitoring guide and forms written and distributed. • Project technicians and select beneficiaries trained in monitoring. • Annual monitoring reports.	2. Covered in mitigation budget; MM #2 of Habitat and Biodiversity Loss
	3. Condition disbursement of USAID supported credit and financing for fencing on the completion of pasture and herd management training.	3. See MM#2 of Deforestation/Expansion of Agricultural Frontier	3. No additional costs
	4. Contract a hydrologist to develop a sub-surface water-monitoring program in which he/she will define an early warning system that will describe simple water quality and quantity testing, frequency of measurements, and test sites appropriate to the hydrological context of the Chapare and the proposed well-drilling activities.	4. Hydrologist contracted. Completion sub-surface water-monitoring plan developed.	4. Covered in mitigation budget: Habitat, Biodiversity and Water Pollution MM #4
	5. Write a best management practices manual of silvopastoral practices and localized mitigation measures based on existing literature from Bolivian institutions and other sites around Latin America with similar environmental conditions.	5. Peer review of BMPs manual written before implementation of project activities.	5. Three peer review honorarium: $6,000

Environmental Issue:	Mitigation Measures	Monitoring/Indicators	Estimated Costs/ Responsible Party
Integration of forest and environmental management with livestock production.	1. Exchange technical knowledge and experience between the representative disciplines of CONCADE technicians and institutions through thematic workshops and the formation of multidisciplinary teams of extensionists.	1. Published bi-annual workshop reports that summarize workshop activities and identify attendance by technician discipline and institution.	1. No additional costs
	2. Establish up to three demonstration farms for each identified production system and precipitation zone in the Chapare that can be used for training, promotion, and research in silvopastoral systems and management.	2. Fully developed demonstration farms within each region of the Chapare by end of year 2 of project. • Annual reports of farm activities in training, research, and production.	2. Costs covered in mitigations budget; Integration MM #2
	3. Conduct training with beneficiaries in the field – on the farm – developing "field schools" in which farmers learn new technologies by doing them.	3. Published reports summarizing field school activities, attendance, and defined follow-up activities.	3. No additional costs
	4. Establish an early warning system that monitors behaviors and management activities and identifies potential areas of supplementary training or extension support.	4. Annual report on findings of early warning system which includes recommendations for project adaptations.	4. $5.054/year, DAI/Capacitacion y Ecopuecuario Programs
	5. Carry out participatory research activities with project beneficiaries that test and adapt silvopastoral and livestock production (nutrition, management, sanitation, reproduction) technologies to the biophysical and climatic reality of the Chapare.	5. Participatory research program and implementation plan designed in first six months. • Incorporation of research findings into annual project evaluations.	5. Cost covered in mitigation measure budget; Socioeconomic Sustainability MM #2

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APPENDIX A

Environmental Consequences and Mitigation Measures Matrix of Preferred Alternative

N[a]	Component And Activities	Environmental Impact	Mitigation Measures	Comments And Recommendations	Estimated Costs
1	**Selection and Organization of Beneficiaries**				
1.1	Identify potential beneficiaries	Deforestation, soil compactation, and water pollution within areas inadequate for cattle raising.	Prioritize potential beneficiaries based on the following criteria; location of farm in biological corridors, presence of degraded pastures, proximity to protected areas, and location on sensitive lands.	Beneficiary selection based on watershed analysis is recommended.	No cost; included in project estimated costs.
			Do not implement project activities within a protected area or TCO before defining a compliance strategy with the norms of Bolivian Protected Area Laws, or with indigenous land regulations.		No cost; included in project anticipated costs.
			Develop implementation strategies based on a characterization of production systems, such as; commercial, subsistence, dual purpose, and "engorde" farms. Analyze the socio-cultural, economic and management factors that define these systemsnd map them.	In farms under production for domectic consumption, strengthen and introduce alternative productive activities such as agroforestry, compost production or camu camu production.	Study: $5,000
1.2	Project promotion and organization of beneficiaries in existing associations that fall within environmental criteria.	Secondary and primary growth cleared in anticipation of project livestock production benefits.	From the start of project planning and throughout its implementation the project will communicate to potential beneficiaries that farmers who deforest their lands are at risk of losing project benefits.		No cost; included in project anticipated costs.
			No beneficiary will be selected to participate in the project who is not already raising cattle		No cost; included in project anticipated costs.
1.3	Beneficiary selection and organization considers women's role in agricultural production.	Better environmental conditions resulting from focusing resources on persons responsible for herd sanitation, nutrition, and management.		Recruit women to participate in decision-making processes related to project activities.	
1.4	Integrate beneficiary selection and activity implementation with credit and funding programs supported by USAID.	Decrease agricultural expansion into inadequate areas.	Project will develop a review process that conditions access to US AID supported credit or financing for infrastructure development and plant material on the completion of forest management plans. Base financing on carrying capacity.	Coordinate and time activities to be carried out based on availability of plant material and tools.	No cost; included in project anticipated costs.

	Component And Activities	Environmental Impact	Mitigation Measures	Comments And Recommendations	Estimated Costs
2	**Develop Forest and Farm Management Plans**				
2.1	Full farm forest inventory.	Rational timber exploitation on farm	Identify and preserve valuable species as seed providers.		No cost; included in project anticipated costs.
2.2	Develop farm management plans.	Better land use; reduction in physical and chemical impacts on soil	Estimate carrying capacity to complement silvopastoral farm management plans.	Develop *Planes de Ordenamiento Predial*	No cost; included in project anticipated costs.
				Farm management plan should include forestry; pasture and and cattle management; and production based on a diagnosis of soil capacity and the ecological landscape	
2.3	Develop Land Use Plans for at least 20 years.	Reduction of timber species due to forest exploitation	Plan reforestation with commercially valuable species adequate for topography and weather conditions.		Seedling cost/number/ $$ per seedling
			Develop forest management plans under a sustainable exploitation system.		
		Loss of primary forest	Develop secondary forest plans that provide natural regeneration.		No cost; included in project anticipated costs.
		Change of floral composition	Contract a biologist to develop a simple habitat and biodiversity monitoring program, appropriate for implementation by farmers & technicians in conjunction with local extension services.		biologist, equipment
		Destruction of biological corridors	Develop management plans intended to maintain or improve connectivity to biological corridors.		No cost; included in project anticipated costs.
			The monitorin plan must include connectivity between existing corridors, primary and secondary patches, and primary forest expansion.		GIS Technician; satellite imagery.

	Component And Activities	Environmental Impact	Mitigation Measures	Comments And Recommendations	Estimated Costs
3	**Establishment of Silvopastoral Practices**		Project planning and implementation will be adapted annually based on the findings and recommendations of a yearly technical and participatory evaluation of project activities.		No cost; included in project anticipated costs.
			Measure the degree to which silvopastoral activities have been carried out, number of trees planted, survival rates, number of hectares planted in improved pasture, and carrying capacity. Incorporate monitoring and participatory research findings.		
3.1	Live fences and posts	Reduce extraction of timber from surrounding forests	Consider the species adequate to the region and topography.		No additional cost; projec anticipated costs.
			Protect recently planted trees from cattle.		Wire; ? Meters, $$, how many meters anticipated?
3.2	Introduction of multipurpose trees in pastures, for shadow, forrage, fruit, firewood, timber	Increase ecological services by diversifying commercially valuable and productive plants.	Establish silvopastoral activities based on a logical procedure of project activity implementation that favors a high rate of survival of forest species.	Consider an agroforestry phase that supports establisment of planted trees and recuperation of the soil before grazing begins	No cost: anticipated in the project
			Consider species adequate to the region and topography.		No cost: anticipated in the project
		Maintain and improve biological corridors	Design live post and multipurpose tree location taking into account the connectivity to biological corridors.		No additional cost; included in project implementation anticipated costs.
3.3	Reforest with tree species best adapted to climatic and edaphic conditions	Plantation style reforestation can diminish biodiversity	Associate different tree species and multistrata bushes.		Legume seedlings or seeds, $$/plant, how many plants?
3.4	Protect farm rivers, streams, and wetlands	Improve water quality and water habitat quality.	Fence wetlands, riparian areas, and eroded streams where cattle can enter.		Wire; ? Meters/$$, how many meters estimated?
			Reforest and establish erosion control structures in areas with lower natural recuperation potential.		Planting material, wire netting, stones, labor; what is the cost for 100 meters?
3.5	Sowing of protein banks	Disminish soil compactation, and increase productivity per area.			

	Component And Activities	Environmental Impact	Mitigation Measures	Comments And Recommendations	Estimated Costs
4	**PatureRecuperation and Management**				
4.1	Recuperate degraded pastures with machinery	Soil erosion	Plow with the contour of the land; level plowed land to decrease soil erosion.		
		Interrupt natural drainage patterns on farm	Where necessary, establish drainage to diminish plowed land erosion potential.		Labor
			Comply with the Norms of the Forest Law to protect ecological rights and absorption zones surrounding streams, rivers and wetlands.		
			When recuperating soil with dolomite comply with the Environmental Assessment for Fertilizers, and do not surpass the limit of 1,000 kg /ha.		
4.2	Pasture division	Diminish soil compactation by decreasing stocking rate and increasing carrying capacity on soil	Implement pasture systems that respect carrying capacity together with pasture division and occupation and rest periods.		No additional cost; included in project implementation anticipated costs.
4.3	Train ranchers in herd rotation	Regenerate vegetative cover in grazed pastures	Condition disbursement of US AID supported credit and financing for fencing on the completion of pasture and herd management training.	Establish model farms where herd rotation demonstrative practices can be carried out.	No additional cost; included in project implementation anticipated costs.
			Recruit women and other ranching family members to participate in training.		No additional cost; included in project implementation anticipated costs.
4.4	Associate improved pasture grasses with nitrogen-fixing legumes	Increase vegetation cover and soil fertility.		Use pesticides adequate for the zone and based on measures outlined in USAID Pesticide EA	
		Changes in native floral composition	See monitoring mitigation under Activity 2.		Cost: hire a biologist, field equipment, computer
4.5	Manage carrying capacity for short- and long-term	Diminish soil compactation		Establish "grass banks" in underutilized areas per association, which can serv as "auxiliary" pasture.	
				Design herd rotation taking into account dry and rainy seasons.	
		Increased deforestation resulting from herd increase as capital becomes more available.	Associate funding and credit level based on carrying capacity established in farm plan without new pasture expansion.	Research the natural succession of land from pasture to "chume" to primary forest and develop land management practices that imitate the process.	No additional cost; included in project implementation anticipated costs.
			Write a best management practices manual of silvopastoral practices and localized mitigation measures based on existing literature from Bolivian institutions and other sites around Latin America with similar environmental conditions		

	Component And Activities	Environmental Impact	Mitigation Measures	Comments And Recommendations	Estimated Costs
5	**Infrastructure Establishment and Improvement**				
5.1	Construct or repair milking facilities and corrals	Surface water polluted by waste	Locate infrastructure at > 50 meters from water; (respect Forest Law Regulation)		No cost: anticipated in the project
			Integrate waste management strategies,		No cost: anticipated in the project
			Create buffer zones between infrastructure and water.		No cost: anticipated in the project
		Pressure on wood resources	Buy wood from vendors with Forest Management Plans	Use other types of materials	Materials, wood
5.2	Establish livestock watering tanks and salt licks	Soil compactation around the infrastructure		Design the farm to aovid moving water tanks; locate them on leveled land and already degraded areas.	
5.3	Develop water systems; well drilling	Reduction of water table.	Contract a hydrologist to develop a subsurface water-monitoring program in which he/she will define the methodology, frequency of measurement and test sites appropriate to the hydrological context of the Chapare and the proposed well drilling activities.		Hydrologist hiring; monitoring
		Well polluted by human and animal feces.	Locate management corrals, milking facilities, and other feces accumulators at least at 50 meters from a well.		No cost: anticipated in the project
			Comply with Law 1333 Norms and regulations from Bolivian health authorities		No cost: anticipated in the project

	Component And Activities	Environmental Impact	Mitigation Measures	Comments And Recommendations	Estimated Costs
6.1	Genetic improvement of herds	Expansion of agricultural border due to increase in production	The project will not distribute live cattle to beneficiaries, nor provide financing or credit for the purchase of cattle in the immediate or medium term.	Search for ways to improve the existing herds with existing purebreed cattle, or through artificial insemination systems.	No costs
			If the project deems it necessary to distribute improved breeds in the future the activity will be proposed to the USAID/Bolivia Environment Office for further review and approval, based on the following studies;	Carry out a cattle census per organization.	$200 per head
			The project will document the results of distribution of improved breeds during the experimental phase (2001-2003); measure survival rates, production, land conversation rates on recipient farms, and farmer acceptance of the introduced animals.		Independent Consultant
			If seeking USAID Envrionment Office for approval for future cattle distribution, carry out a detailed study of the gene pool of the beneficiaries' herds with specific recommendations for breeds, numbers and distribution		No costs
			Access to credit or funding (provided by USAID) for genetic improvement conditioned on compliance with farm management plan, establishment of a silvopastoral system, and carrying capacity of the farm.		No costs
			The introduction of small animals such as goats and sheep, requires a supplementary environmental assessment.		
6.2	Rancher training on nutrition, sanitation, and animal management topics, as well as on other related activities	Increase productivity per head of cattle	Develop training sessions following sanitary and vaccination calendar; control of foot and mouth disease; herd productive and reproductive registers; and other methods of animal management and control.	Demonstrate through participatory research that better production in a smaller area and with the same number of animals or even less, can be achieved.	Training sessions' cost: nr. of trainings/days/farmer
			Motivate women's participation in training sessions.		No costs
6.3	Nutritional supplementation with by-products from the zone	Reduce and improve management of waste from processing plants and packing centers in the Chapare.		Develop an internal market system among processors and ranchers.	

	Component And Activities	Environmental Impact	Mitigation Measures	Comments And Recommendations	Estimated Costs
6.4	Facilitate the development of livestock policies and environmental regulations with Bolivian institutions involved	Improve environmental conditions through strengthening of regulation and control mechanisms.	Conduct a policy analysis of environmental management of livestock production; identify the gaps in regulation and control and create a strategy to develop and strengthen incentives and regulation for silvopastoral management in the GOB context.		Consultant/technician

	Component And Activities	Environmental Impact	Mitigation Measures	Comments And Recommendations	Estimated Costs
7	**Training**				
7.1	Training activities carried out in the field	Integration of environmental management in livestock and pasture management practices.	Conduct training with beneficiaries in the field – on the farm – developing "field schools" in which farmers learn new technologies by doing them.	Link training and extension with farm plan development and strengthening of chain of production and marketing of milk products	Who will do this, for how long? Costs of one day workshop/15-20 people, approx. 20 trainings.
			Establish up to three demonstration farms for each identified production system and precipitation zone in the Chapare that can be used for training, promotion and research in silvopastoral systems and management.	Integrate research and the development of a demonstrative farm with the research center of the University San Simon.	Locating the demonstrative farm in an existing farm - for instance, that of Mr. Bustamante's - costs are minimal. (The owner should be paid for the use of its farm). Equipment, materials, etc.
7.2	Offer validated technology	Improve environmental protection techniques in the context of the Chapare	Carry out participatory research activities with project beneficiaries that test and adapt silvopastoral and livestock production (nutrition, management, sanitation, reproduction) technologies to the biophysical and climatic reality of the Chapare.	Research to be carried out include; e.g.: impacts on the biodiversity, production and management systems in small, medium and large farms; impacts on wetlands; wetland management within silvopastoral systems.	Requires employing a trainer prepared on participatory research
			Introduce scientific research programs, and validate technologies on aninal production, feeding, management and sanitation.	Incorporate the new IBTA in the development of research and technology validation program	
			Establish an early warning system that monitors behaviors and management activities and identifies potential areas of supplementary training or extension support	The biological monitoring program should recruit youth from neighboring areas to collect and analyze data	?
7.3	Train technicians and extensionists on silvopastoral practices.	Increase dissemination of silvopastoral management knowledge and environmental management of livestock production between technicians and beneficiaries	Exchange technical knowledge and experience between the representative disciplines of CONCADE technicians and institutions through thematic workshops and the formation of multidisciplinary teams of extensionists.		No additional cost; included in project implementation anticipated costs.
				Collect and systematize all existing information on ecology, botanics, and biology from the Chapare.	
7.4	Massive communication of objectives, benefits, and practices of a silvopastoral system	Improve environmental protection techniques in the context of the Chapare		Include mass communication on silvopastoral system through existing social communication systems.	

APPENDIX B

Scoping Results

APPENDIX B

Scoping Results

List of Key Informants

Name of Individual	Institution/Department	Date
Jaime Validivia, Director	DAI/Environmental Unit	October 7, 2003
Fabian Aguirre, CTO	USAID/Bolivia	October 7, 2003
Armando Ferrufino, Director	IBTA	October 7, 2003
Greg Minnick, Principal Technical Advisor	C-23/Jatun Sacha	October 7, 2003
Jose Espinosa, Technician	C-23/Jatun Sacha	October 7&16, 2003
Barbara Belding, Environmental Officer	USAID/Bolivia	October 8, 2003
Pacifico Aceite, President	Bulo Bulo San Juan Cooperative	October 10, 2003
Napoleon Anachuri, Farmer	Bulo Bulo	October 11, 2003
Ken Swanburg and team, DCOP	DAI/MECPI, ProAg	October 14, 2003
Steve Huffstutlar, COP	DAI	October 14, 2003
Ivan Davalos, Director	CETEFOR	October 16, 2003
Sergio Cassab, Security Director	DAI	October 16, 2003
Michael Painter, Director	WCS/Bolivia	October 20, 2003
Raul Rico, Director	PDAR	October 22, 2003
Mrs.Teofilo Condori, Mr. Ignacio Choque, farmers	Narangitos	October 24, 2003
Asbel Prado P., Technician	C-23/Jatun Sacha	October 24, 2003
Gregorio Coscio, Farmer	San Rafael	October 24, 2003
Monica Crespo, Director	DAI/Indigenous Affairs, Gender & Participation	October 24, 2003
Vilma Crespo & Wanderley Ferreira	CISTEL	October 24, 2003
Victor Bullen, Environmental Officer	USAID/Bolivia	October 27, 2003
Hermogenes Bustamante, President	AGAPLE	October 27, 2003
Carlos Espinosa	Agrarian Superintendent	October 29, 2003
Mario Bustamante	AGAPLE	October 23, 2003

Results of Scoping Meeting, October 23, 2003

Attendance: 81 farmers, 54 men, 27 women
Site: Hotel Petrolero, Entre Rios
Summary of Problems Identified in Farm Maps by Theme

Water and Soils

- Scarcity of water in arroyos
- Water contamination from livestock slaughtering, cattle and other livestock entering and crossing streams, lack of riparian vegetation, and human activities such as fumigation and human excrement.
- Compacted soils from overgrazing
- Soil erosion
- Human health risks from slaughter activities
- Once flowing waters now dammed due to poor riparian management.

Forestry

- Lack of commercially valuable wood species
- *Lack of shade*
- Expansion of agricultural frontier
- Inadequate management of secondary forest
- Lack of technical assistance in environmental management of farm
- Lack of resources to support reforestation

Infrastructure

- Inadequate or nonexistent corrals and milking parlors.
- Inadequate management of slaughterhouses
- Inadequate control over product quality.
- Lack of fencing for pasture divisions.
- Lack of watering tanks for cattle.
- It’s not easy to access production infrastructure
- Poor location of infrastructure on farm.

Pasture management

- Lack of seeds for improved pastures.
- Lack of technical assistance in pasture recuperation
- Scarcity of wood for fence posts.
- Farmers expand pastures to compensate for their degradation.
- Elevated stocking rate

Herd management

- Low genetic quality
- Sanitary problems
- Nutritional problems
- Insufficient veterinary technical assistance
- Low productivity
- Producers are resistant to vaccinating their livestock against foot and mouth disease.
- Lack of stratification of animals.

Production and Training

- Variable quality of milk
- Lack of commercialization
- Need technical veterinary training for women.
- Lack of technical assistance in product transformation
- Lack of credit for ranchers

Miscellaneous

- Improve bridges and roads.

Resultados de la Reunion de Scoping del 28 Octubre 2003

Attendance: DAI: Sergio Cassab, Ricardo Ewel, Guido Teran, Adolfo Fernandez, Javier Ardaya, Jaime Valdivia; PDAR: Raul Rico, Jorge Cuba; C-23/Jatun Sacha: Marcelo Pinto, Jose Espinosa; CISTEL; Wanderley Ferreira; AD/USAID: Richard Fisher.
Presentor: Marsha Kellogg

Comments by Theme

Introduction of Cattle	Zoning of activities in Chapare	Socioeconomic impacts	Miscellaneous
It is necessary to identify the cattle adapted to the environmental conditions of the Chapare before introducing them.	Characterize the zones.	Which alternatives are the most economic for the farmer?	Kudzu is manageable, it is not invasive.
One can base the introduction of cattle on more control over the stocking rate.	Identify the prioirity areas of the project.	The project lacks an economic study.	Condition financing on the implementation of silvopastoral activities.
Of the 1800 cattle introduced during the experiment, 400 were F1 crossbreeds.	Link project costs with the number of beneficiaries.	Economically compare the no action and preferred alternatives.	What has been successful in other countries?
Define the time and resources needed for cattle introduction under each alternative.	Classify the farms that are apt enough to receive cattle.	Research alternative crop species to intercrop on the silvopastoral farms that will improve incomes.	The people (beneficiaries) expect the project to continue.
Which alternatives are more economically beneficial to the farmer?	Develop POPs, but recognize that some farmers won't let technicians on their parcels.	It's necessary to define the environmental and socioeconomic units in use.	It's necessary to define project process; what are the priorities, conditions, follow-up, etc.
What currently exists in the Chapare (What does the cattle inventory say?)	What are the results of the silvicultural part of the experiment? Where do they recommend which trees to be planted?		Create a process that leads from a silvoagricultural to silvopastoral system.
What are the results of introduction of cattle during the experiement? Research the environmental effects, the acceptance and adaptation of the introduced breeds.			Capture existing silvicultural, silvopastoral and ecological experiences and research, document them, catalog them and make them available to others.
Support the farmers that already have cattle.			Consider medium term steps such as planting fruit trees and multistoried trees.
Introduced breed is "final prize"; exchange it for one that is less productive.			

APPENDIX C

List of Preparers

APPENDIX C

List of Preparers

Marsha Kellogg, MCRP, Natural Resources Planner, Team Leader

Ricardo Ewel, BS, Agricultural Engineer, DAI/ProAg

Jorge Cuba, BS, Agricultural Engineer/Project Planner, PDAR Agricultural Outreach & Evaluation Specialist

Javier Ardaya, MS, Natural Resources Management, DAI/Environmental Unit

Marcelo Pinto, MS, Environmental Impact Evaluation, C-23/Jatun Sacha

Richard Fisher, MS, Regional Coordinator, USAID Cochabamba

APPENDIX D

Characteristics of Different Breeds of Cattle in the TC

APPENDIX D

Characteristics of Different Breeds of Cattle in the TC

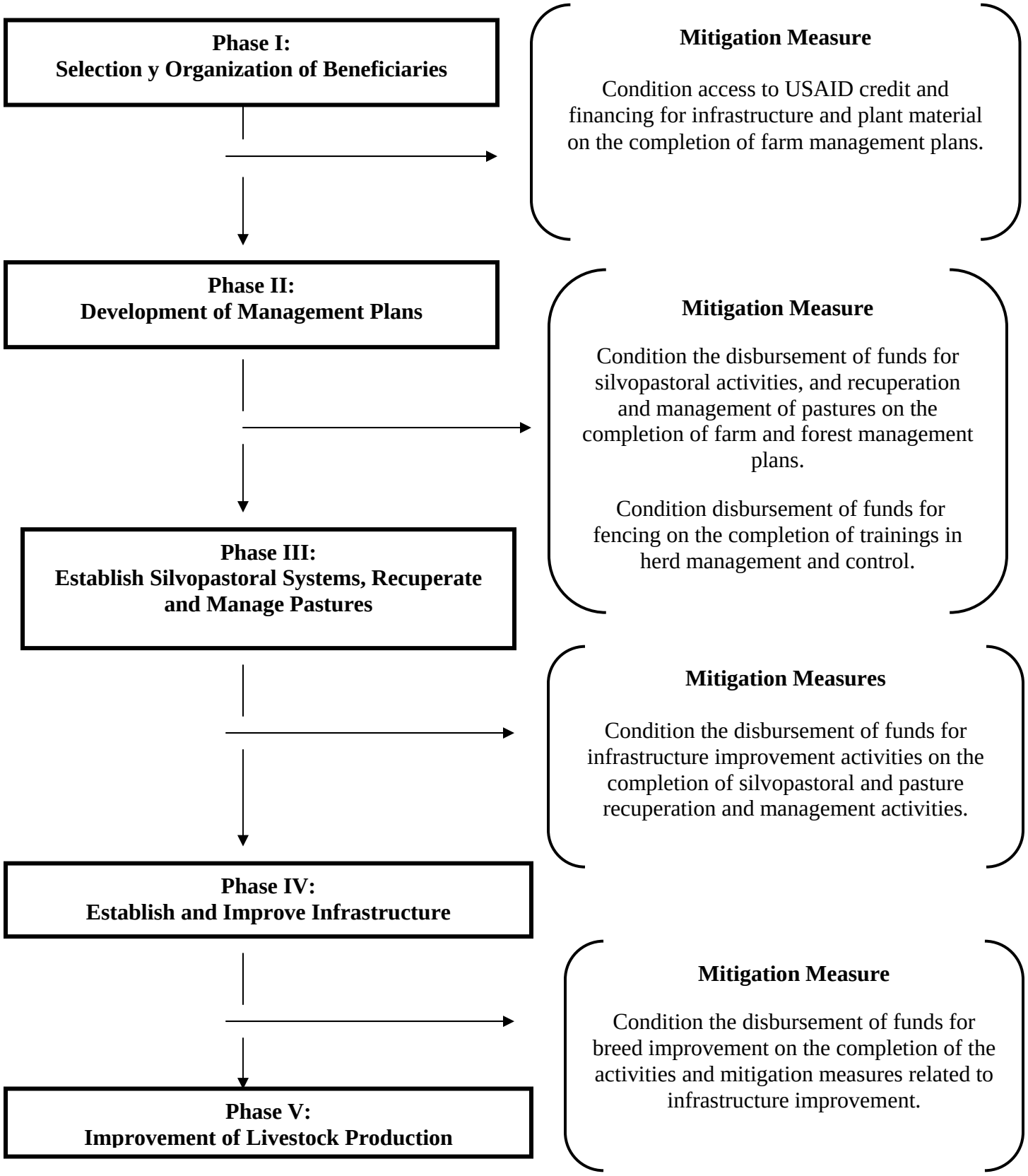
Breed	Product	Advantages	Disadvantages	Zones
Holstein	Milk, Dual Purpose	High milk producer, large size, tame, semi-heavy calf. They can be used in zones with climates like those found around Paractito and Muyurina.	Very susceptible to parasites, disease and hot climates. Consume large amounts of feed, need high quality pastures and nutritional supplements.	Foothills (zona del CAY)
Pardo Suizo	Milk, Dual Purpose	High milk producer, large size, heavy calf, semi-adapatable to hot climates.	Susceptible to parasites, disease, y hot climates. Consume large amounts of feed, need quality pasture and nutritional supplements.	Tropics of Cocha-bamba
Jersey	Milk	High milk producer, good adaptability to hot climates, do not consume much feed, good on steep slopes, high fat content in milk. Docile.	The males cannot be sold for meat due to their slow growth and yellow fat. This breed is hard to find in region.	Tropics of Cocha-bamba
Pitangueiras	Dual Purpose	Does not require high quality feed. Medium milk producer, heavy calf, high resistance to hot climates. There's a breeder in the Tropics of Cochabamba.	Under good conditions only produces 8 liters/day, short lactation periods, only one breeder in all of Bolivia.	Tropics of Cocha-bamba
Gyr holando	Dual Purpose	Rustic, high resistance to hot climates, produces up to 12 liters/day. Calves reach a good weight for slaughter.	Short lactation period and difficult to extract milk if calf is not with cow. Aggresive after birthing. Thick udders.	Milk Watershed
Criollo	Dual Purpose	European cow often selected for its400 year history of production.	Does not reach high levels of milk production.	
Nelore	Meat Ceba especializada	Rustic, from tropical climates, reaches slaughter weight quickly, is 80% of herd in Bolivia.	For meat production only, tempermental.	Medium precipiation zone.
Brahman	Meat	Rustic, from tropical climates, reaches slaughter weight quickly, y more docile than Nelore. Can be crossed with Holsteins to use off-spring for dual purpose production.	It is essentially raised for meat.	Medium precipitation zone.
F1 Cross-breed	Meat	It is the heterogeneous cross of the breeds Bos taurus y Bos Indicus, takes advantage of the rusticity of one breed and the precociousness of the other. Gains greater than 600 g/day.	They cannot reproduce. Must have a breeder with B. Indicus and B. Taurus available.	

APPENDIX E

Suggested Implementation Procedure for Credit and Financing Related Mitigation Measures

APPENDIX E

Suggested Implementation Procedure for Credit and Financing Related Mitigation Measures



APPENDIX F

Description of Pasture Division and Herd Rotation

APPENDIX F

Description of Pasture Division and Herd Rotation

Farms within the Chapare are too small for continuous grazing, a strategy that maintains a sustainable carrying capacity by virtue of land size, allowing cattle to graze freely over hundreds of hectares with little control over movement. Additionally, because most Chapare farms are dual-purpose, it is important for the farmers to have daily access to their herds. Therefore, the project proposes pasture divisions and herd rotation as one principal rangeland and livestock management strategy, which consists of the following practices:

- Determine surface area available for grazing, the number of grazing animals, and stratification of the herd based on age and sex.
- Calculate carrying capacity based on pasture size and quality establishing periods of occupation and rest. In the Chapare, periods of occupation tend to be 3-4 days. Periods of rest vary based on the species of pasture.
- Divide pasture into the calculated number of smaller parcels necessary to allow an efficient rotation of the herd, stratification of the herd, and periods of rest.
- Establish herd rotation calendar.

The benefits of herd rotation and pasture division are numerous. It decreases the incidence of internal parasites because parasite life cycles are disrupted through the movement. It allows for natural regeneration of forage, which increases its quality and impedes weed invasion. Additionally, herd rotation avoids overgrazing and soil compaction and erosion. Finally, dividing pastures helps the farmer control sanitary conditions and daily herd management.

APPENDIX G

Suggested Implementation Timeframe of Alternative C Components and Mitigation Measures

APPENDIX G

Suggested Implementation Timeframe of Alternative C Components and Mitigation Measures

(As a continuation of the Experimental Phase)

Phase I: Estimated Time	Component	Mitigation Measures	Responsible Institution
8-12 months	Selection and Organization of Beneficiaries	1. Analyze the socio-cultural, economic, and resource management characteristics of production systems in the Chapare and identify regions for adapted project implementation strategies that will respond to varying production characteristics while striving to decrease deforestation.	1. C-23/DAI
		2. Prioritize potential beneficiaries based on location of the farm in biological corridors, presence of degraded pastures, proximity to protected areas, and location on sensitive lands. Incorporate beneficiaries into project that were not previously selected during experimental phase.	2. DAI/IBTA
		3. Analyze the survival rates, production, land conversion rates, and farmer's acceptance of the improved breeds distributed during the experimental phase. Extract lessons learned.	3. IBTA
		4. Conduct a policy analysis of environmental management of livestock production in the Chapare; identify gaps in regulation and control and create a strategy to develop and/or strengthen incentives and regulations for silvopastoral management in the GOB context.	4. DAI/ Policy Unit
		5. Develop financing and credit review processes that condition awards on completion of project activities as defined in Appendix D.	5. DAI/C-23
		6. Define compliance strategy with GOB Protected Areas norms and TCO regulations.	6. DAI/C-23/CI/GOB
		7. Define strategy to actively support the inclusion of women and family members in training activities.	7. DAI/ProAg Training Unit
		8. Identify and organize participants (probably *promotores*) from the experimental phase and design participatory research activities for the next year.	8. DAI/ProAg Training and Extension Units
		9. Write a best management practices manual of silvopastoral practices and localized mitigation measures based on existing literature from Bolivian insititutions and other sites around Latin America with similar	9. DAI

Phase I: Estimated Time	Component	Mitigation Measures	Responsible Institution
		environmental conditions. 10. Communicate to potential beneficiaries that deforesting lands can result in losing project benefits.	10. DAI/ C-23
Phase I / 3 – 6 months	Forest and Farm Management Plans	1. Exchange technical knowledge and experience between the representative disciplines of CONCADE technicians and institutions through thematic workshops and the formation of multi-disciplinary teams. (First series of workshops should be focused on comprehensive farm management planning.) 2. Develop farm and forest management plans that assess and analyze carrying capacity, soil capacity, topography, connectivity, sustained yield, access to livestock and forest products markets, and farmer production goals. 3. Define buffer zones around arroyos, rivers, and wetlands in accordance with GOB Law 1700.	1. DAI/C-23/IBTA/PDAR 2. Multidisciplinary technical teams/ beneficiaries 3. DAI/C-23
Phase II / 18 – 24 months	Pasture Rehabilitation / Establishment of Silvopastoral Systems	1. Plowing on selected beneficiary farms will occur during the dry season and follow the contour of the land. Mitigate impacts on natural drainages. 2. Dolomite application will comply with USAID fertilizer regulations and not exceed 1,000 kg/ha. 3. Establish a logical implementation process of the silvopastoral activities that will favor a high survival rate of planted seedlings. 4. Plant live fence tree species adapted to biophysical conditions. 5. Conduct early warning system diagnostic with potential beneficiaries. 6. Conduct herd rotation trainings with project beneficiaries along with pasture management and division activities. 7. Fence cattle out of wetlands, rivers, and severely eroded arroyos. 8. Design and implement yearly technical and participatory evaluation of project activities. 9. Continue participatory research and testing activities. 10. Continue inter-institutional and cross-disciplinary workshops.	1. DAI/C-23 2. DAI/VC-23 3. DAI/C-23 4. C-23/DAI 5. DAI/ProAg Training and Extension Units 6. DAI/ProAg Training and ExtensionUnits 7. DAI/C-23 8. C-23 9. DA 10. DAI/ProAg Training and Extension Units

Phase I: Estimated Time	Component	Mitigation Measures	Responsible Institution
Phase II / 3-6 months	Livestock Management	1. Carry out trainings with women and men in sanitation and vaccination planning, control of *fiebre aftosa*, production and reproduction record-keeping, and veterinary "first aid".	1. DAI/ProAg training and extension
Phase III / 12 - 18 months	Establish Silvopastoral Systems	1. Identify and set up demonstration farms that reflect the various environmental factors and production systems in the Chapare. 2. Establish erosion control structures on severely eroded lands with little potential of natural regeneration. 3. Associate tree species of different strata in plantation style reforestations to create multi-strata forest cover. 4. Contract biologist to develop and carry out vegetation composition and ecosystem-dynamics monitoring. 5. Continue participatory research and testing activities. 6. Conduct yearly technical and participatory evaluation of project activities.	1. IBTA 2. C-23/DAI 3. C-23 4. C-23 5. DAI/ProAg Training and Extension Unit 6. C-23
Phase III / 18 – 24 months	Infrastructure Improvement & Livestock Management	1. Infrastructure will be sited greater than 50 m from superficial waters and water sources – in compliance with Bolivian Forestry Law 1700 – and vegetative buffer zones will be planted between infrastructure and water body when infrastructure located upslope. 2. Train farmers in waste management strategies to decrease the impacts of concentrated wastes in and around infrastructures. 3. Implement stud servicing or artificial insemination programs. 4. Contract a hydrologist to develop a sub-surface water monitoring program appropriate to the hydrological context of the Chapare, and relevant to the proposed well-drilling CONCADE activities. 5. Conduct yearly technical and participatory evaluation of project activities. 6. Continue participatory research and testing activities.	1. DAI/C-23 2. DAI 3. DAI 4. C-23 5. C-23 6. DAI/ProAg Training and Extension Unit

ANNEX 4

Case Study of the Hotel Victoria Resort

EXECUTIVE SUMMARY

The present case study applies the guidelines of the *Guidance Manual for the Environmental Design, Implementation and Operation of Tourism and Eco-Tourism Facilities and Activities* that has been developed with the Programmatic Environmental Assessment of Tourism and Eco-Tourism Facilities and Activities in the Tropics of Cochabamba to the Hotel Victoria Resort in Villa Tunari.

The Hotel Victoria Resort (HVR) is a lodging facility with 26 rooms, 9 cabins, a swimming pool, a restaurant and a meeting room on a nine acre property. It is representative of the few larger accommodation facilities in the Villa Tunari area, where the majority of establishments are of the bed and breakfast type. Due to its location outside the city limits, the HVR does not benefit from the municipal sewerage or solid waste collection system and has to address wastewater treatment and solid waste management on property.

The HVR has used certain design features in its buildings to allow for natural ventilation and lighting, thus reducing the electricity requirements for artificial illumination and air conditioning. In addition the hotel separates some recyclable products from its solid waste and allows organic garden waste to decompose naturally. Wastewater is treated on property in septic tanks before being discharged into leachfields.

The review of the Hotel Victoria Resort's installations and operations has shown that the hotel has implemented various environmental measures starting at the design stage prior to construction. However, the hotel's current day-to-day management could be improved to reduce the environmental impacts caused by its operation.

In this context the case study recommends the implementation of Best Practices that would help the HVR to improve its environmental performance by reducing the consumption of natural resources, such as water and energy, and minimizing the generation of solid and liquid wastes.

In particular, the HVR should consider introducing a system to monitor its energy consumption and other operational indicators as only what is measured can be managed. Installing controls for the air condition units and the exterior lighting fixtures will help to reduce energy consumption.

Most important the HVR should consider addressing health and safety issues, such as ensuring the quality of the fresh water supplied to the rooms, reviewing electrical installations of the hot water showerheads, and the handling of hazardous substances, such as gasoline on property.

The implementation of Best Practices in energy, water, wastewater and solid waste management improving the operation of the HVR could reduce the environmental impact caused by the hotel and provide savings in the hotel's operational cost.

1. Introduction

This case study is intended to provide a practical application of the guidelines of the *Guidance Manual for the Environmental Design, Implementation and Operation of Tourism and Eco-Tourism Facilities and Activities* that has been developed along with the Programmatic Environmental Assessment of Tourism and Eco-Tourism Facilities and Activities in the Tropics of Cochabamba.

The team of consultants selected the Hotel Victoria Resort (HVR) based on the size and accessibility of the property as well as the cooperation offered by its management and staff to undertake the study. In addition, because it is located outside the town limits of Villa Tunari, the HVR is of interest since it is not connected to the municipal sewage system nor to part of the municipal solid waste collection system. Therefore the hotel has to address wastewater treatment and solid waste management on its own, which allows reviewing a wider range of environmental impacts caused by an accommodation facility.

This case study was undertaken while still refining the environmental guidance manual. As a result, this review casts an operational lodging facility against the draft guidelines. Because the facility was already in operation, the site selection and site planning criteria contained in the guidance manual could not be applied.

2. Background and Supporting Documentation

There was no supporting documentation available to the consultants concerning this facility. Information was limited to basic occupancy data provided by the VHR head office in Cochabamba. The consultants inquired about additional information such as electricity consumption and cost, however, these could not be obtained within the time available. In general, owner documentation of operational indicators at the hotel, such as electricity, water consumption or occupancy data, seemed to be limited to non-existent.

3. Description of the Hotel Victoria Resort

The Hotel Victoria Resort is located on the main road from Cochabamba to Villa Tunari a few kilometers before reaching Villa Tunari. The HVR has 26 rooms distributed over two buildings with 12 and 14 rooms respectively and 9 individual cabins. Further construction includes:

- The main service building with the reception, the kitchen and a meeting room on the second floor above the kitchen;
- The restaurant area located under a big thatch roof structure (*jatata*) connected to the service building; and
- A swimming pool.

Construction of the HVR began in March 1999. In 2000 the owner added 4 cabins and the final 5 cabins were completed in 2002. The HVR currently employs 12 permanent staff.

3.1 Site and Design

Hotel Victoria Resort's property is about 3.5 hectares in size of which 1.5 hectares have been developed. The buildings are grouped around the swimming pool in the center of the property. With original vegetation being cleared for construction, the VHR has ample garden space with

an extensive lawn area around the pool. The landscaping of the garden uses coconut palm trees and ornamental plants.

View of the VHR with cabins in front and the restaurant building in the background

3.2 Building Design

The buildings and cabins are built on concrete floor foundations with walls of block (within concrete columns). Clay bricks are used for the façade. The roof structure is made of wooden beams and has a laminate of fiberglass as roof cover.

The roof cover is partly open to allow for the escape of warmer air and natural ventilation. In addition the roof laminate integrates translucent sheets that permit daylight to enter the hallway as well as the bathrooms. The use of natural light in these areas reduces the need for artificial light sources during daytime.

View of building with 12 rooms

3.3 Infrastructure, Support Systems and Operation

3.3.1 Energy

The VHR is connected to the local electricity grid operated by the energy provider ELFEC. The electricity meter is located to the far right of the entrance. The electrical energy supplied is used for all illumination needs, the window air conditioning units, the pool pumps, the water heating showerheads, and refrigeration units in the kitchen.

The kitchen uses liquid petroleum gas (LPG) supplied from cylinders for stoves and ovens. For garden maintenance, the VHR uses gasoline-operated equipment and a gasoline-operated pump to pump water from the creek to the main holding tank and from there to the elevated tank.

The hotel installed energy-efficient fluorescent light bulbs in the guest rooms and in front of the restaurant. Incandescent bulbs are used in the guest bathrooms, the entrance to the guest rooms, as well as for the lamp on the night table.

Fluorescent light bulbs in the restaurant area and guest room

3.3.2 Fresh Water

The HVR receives fresh water from three sources:

- The municipal water supply system
- A water supply system operated by a cooperative (sindicato)
- A creek adjacent to the property

The municipal water supply line is equipped with a water meter and the hotel is charged based on its consumption. However, according to the person responsible for maintenance, the municipal water supply is very irregular and recently no water has been received.

To circumvent the unreliability of its principal water supply, the hotel is connected to a water system operated by one of the local cooperatives (sindicatos). As a third option, the hotel installed a connecting pipe to a creek adjacent to the property.

Fresh water supply to underground storage tank

The water enters into underground storage tank of approximately 45,000 liters. From there the water is pumped to an elevated tank about 10-12 m above ground in order to supply the water to the buildings by gravity feed.

The water is not treated or filtered. Chlorine is added only occasionally. However, there is a small treatment system for the water used in kitchen operations.

3.3.3 Wastewater Water Treatment

There is no municipal sewer system to discharge the hotel's wastewater.[4] Each building has two septic tanks while the cabins are equipped with individual septic tanks. The residual water from the bathrooms is initially drained in separated drain pipes, one for graywater from the hand-wash basin and the shower, and the other for wastewater from the toilet. However, it seems as if graywater and wastewater drainage is joined once outside the building and discharged into the same septic tank.

[4] Within the town limits of Villa Tunari, there is a municipal sewer system, but the system is said to be old and the wastewater collected is eventually discharged without treatment into local water bodies and rivers.

Drainage for graywater next to block with 12 rooms

Each septic tank is built in form of an underground chamber (2 m wide and 3 m deep) with a solid concrete floor. The walls of the chamber are lined with stones. The septic tank is equipped with an inspection hole secured with a 4-inch PVC pipe. The inspection opening did not allow for visual confirmation of the construction details. The chambers are equipped with drainpipes to allow the liquids to flow into the subsurface of the gardens.

Since inception of the hotel the chambers have not required maintenance and visual inspection showed levels to be very low.

When under construction the HVR excavated an area for a central septic tank for the entire hotel. However, although pipes were laid to connect the buildings with this central septic tank, it was never finalized. Currently the excavated area is refilled with garden waste.

3.3.4 Solid Waste

There is no local or municipal waste collection system that would recollect solid waste from the hotel.[5]

[5] Solid waste collection is limited to the center of the town of Villa Tunari. The municipal service includes collection twice a week and disposal in undisclosed areas sometimes close to rivers where the waste is doused with diesel and then burned. Thereafter the remainders are either buried or swept away by the river.

The staff of HVR separates plastic (PET) and glass bottles from the solid waste generated by the hotel. The bottles are collected by local individuals. All other waste is buried in on property and covered with a layer of soil on a daily basis.

Burying of solid waste and separation of plastic bottles (PET)

Garden waste such as grass cuttings and tree clippings is kept separate from other waste. It is used to fill natural or excavated cavities on the property and decomposes naturally.

4. Observations and Best Practices for the Hotel Victoria Resort

This section presents observations concerning operational aspects of the Hotel Victoria Resort and compares them against established Best Practices in hotel operation. The implementation of the Best Practices should assist the HVR to improve its environmental performance and reduce the environmental impact caused by the hotel.

4.1 Environmental Aspects and Impacts

The principal environmental aspects of a hotel operation include the consumption of natural resources, such as energy, water and materials as well as the generation, discharge and disposal of solid or liquid waste products and emissions.

Actual environmental impacts caused by a hotel vary depending on its size, installations, location, and the way in which the hotel is operated. Impacts are classified as follows:

- Energy use
- Water use

- Wastewater generation
- Solid waste generation
- Generation of air emissions
- Use of hazardous substances or harmful products

While the fact that water bodies or land can be contaminated with untreated sewage or solid, hazardous and toxic waste is recognized, the environmental impact of consuming energy is not always that obvious. One explanation might be that energy generation takes place at great distance and is not noticed in the immediate surroundings of the consumer. However, it is essential to note that energy conservation yields important environmental benefits that include:

- Fossil fuels such as diesel or natural gas are not renewable and conserving energy will help to extend availability of these resources.
- Saving energy reduces emissions of greenhouse gases and other pollutants.

Increasingly environmental issues are included by tour operators and guests in the decision making process when planning tours and vacations. Implementing energy conservation measures demonstrates to guests and tour operators alike that the hotel is proactively minimizing its impact on the environment. This approach is even more important in areas that are promoted as nature or eco-tourism destinations.

4.2 Energy Management

Excessive energy consumption also caused by inefficient use of energy results in increased operating cost, reduces profitability, and needlessly increases the hotel's impact on the environment.

Although we have seen that the HVR has implemented some energy conservation measures by installing energy saving light bulbs and using natural light to illuminate guest bathrooms and hallways, there are still opportunities to reduce energy consumption at the hotel.

Energy monitoring and record keeping

The first step to conserving energy is to know how much energy is being consumed by the hotel and being able to track ongoing energy use. The tools for doing this are an electricity meter and a good record keeping system.

Currently the HVR does not monitor its energy consumption. The monthly invoices sent by ELFEC, the energy supplier, are forwarded to the Cochabamba office. No record is kept at the hotel.

With the electricity meter easily accessible on the property, the HVR should consider implementing a record keeping system that will allow the hotel to:

- Define and understand its normal consumption patterns
- Identify unusual shifts in consumption that may indicate equipment problems
- Control monthly billing by the electricity provider
- Define its energy saving goals, and

- Evaluate the progress and savings achieved by the hotel's conservation efforts

Ideally the electricity meter should be read daily at the same hour of the day. The reading is to be documented in a log sheet. The collected data should be used to calculate the amount of electricity used over a monitoring period. This period could coincide with the calendar month or the billing period used by ELFEC. At the end of the month, the HVR should calculate its energy use index using consumption and occupancy data compiled over the past month. Total energy consumption and the energy use index should be compared with the results of preceding intervals to identify unusual or unexplainable changes.

Controls for air conditioning window units
The HVR recently installed window air conditioning units in the majority of its rooms and plans to equip all rooms with air conditioning. The units are remote controlled but have no further control switch that would turn off the equipment in the case of the terrace door being left open or the guest leaving the room. The hotel just started to fit hanging ceilings to reduce the volume of air in the guest room that has to be cooled.

With the installation of the window a/c units, the HVR will note a considerable increase in its electricity consumption. Although hotel management mentioned that staff is instructed to turn off the a/c when the guest is not in the room, the consultants could not confirm this procedure.

The HVR should consider installing a main switch for the operation of the a/c that requires the room key to operate the unit. The guest would have to insert his/her room key to turn on the a/c. Once the guest leaves the room and takes his/her key along, the unit would have to be turned off. In addition the hotel could install a contact switch that would interrupt power supply to the a/c unit in case the terrace door is opened. As the units are located close to the sliding terrace doors, installation of a contact switch should be fairly easy.

Sensors for external lighting
The consultants observed that the hallway lights were not always turned off in the morning, even though there was sufficient daylight to illuminate the hallway.

Hallway lights during morning hours

Using photo sensors to turn on and switch off exterior lighting helps to maximize the efficient operation of public area lighting. The sensor that functions based on daylight intensity will turn on public area and garden lights at dusk and switch them off at dawn.

Solar water heaters

Currently the HVR uses electrical showerheads to heat the water in the shower stalls. Solar water heating is a proven and readily available technology that uses the sun's energy to replace or supplement conventional water or pool heating systems. Solar water heaters are environmentally friendly, consuming no fossil fuels and producing no pollution.

Solar water heaters are used in Cochabamba and several companies install systems. Climate conditions between Cochabamba and the Tropics of Cochabamba vary considerably, in particular regarding the level of precipitation. Annual rainfall around Villa Tunari with 4,000 mm to 7,000 mm per year is several times higher than in Cochabamba. However, the majority of rainfall takes place throughout three months of the year and solar radiation might be sufficient to achieve satisfactory results with solar water heaters.

Although at current occupancy levels the payback period for a solar system might be unattractively long, once the HVR sees higher and steadier occupancy the hotel could consider the use of solar water heaters. As a first step the hotel could ask for a proposal including a cost-benefit analysis from one or two of the solar system providers in Cochabamba.

4.3 Water Management

The VHR receives fresh water from three different sources. The quality of the water supplied to the hotel is not known, but it can be assumed that it does not meet drinking water standards.[6] Therefore the HVR should indicate in its bathrooms that the water is not potable. Even if the hotel assumes that national tourists are aware of this fact, foreign tourists might not be. Besides, the hotel should consider examining the water in the tanks with the help of a laboratory to establish basic parameters of the water quality used in the hotel's operations. In any case the HVR should consider chlorinating the water in the tanks and take regular measurements of residual chlorine levels to ensure reduction of possible contamination with pathogens.

Reducing water consumption

Although the cost for water at the HVR is minimal, there is a good reason to reduce water consumption. It is estimated that between 70 percent and 80 percent of total water consumption in hotels enter the wastewater treatment system. Consequently reducing water consumption throughout the hotel also reduces the load on the septic tanks of the HVR.

Typical water saving devices include

- Low-flow shower heads
- Faucet flow aerators
- Water saving toilets
- Displacement devices in conventional toilets

The HVR has installed showerheads with an attached electric water heater. Although the flow rate of this showerhead could not be established, visual inspection seemed to indicate a reasonably low flow rate. The faucets installed in the guest bathrooms do not allow for the installation of a flow aerator. In view of the low cost for water and wastewater treatment, replacing faucets with a model that features an aerator is financially not justifiable. Therefore this option should only be considered if replacing a broken faucet.

In addition to installing water saving devices, the hotel should ensure regular maintenance and inspection of its water installations. Water audits at hotels have revealed that it is not uncommon to find leaks in 25 percent of a property's toilets.

4.4 Solid Waste Management

The municipal solid waste collection service does not reach the HVR due to the hotel's location outside the city limits of Villa Tunari. Even if solid waste were collected, the town does not offer adequate disposal options. Current disposal of Villa Tunari's waste is not adequate, and until the currently planned new landfill is completed, there will be no appropriate disposal site for solid waste. Since the HVR has no municipal disposal option, it has to manage its solid wastes on site.

[6] A visit to the source of the municipal water supply of Villa Tunari confirmed that the surface water captured from a creek is merely chlorinated but does not (to date) receive any other purification treatment. Any residual chlorine left when the water arrives at the hotel will be used by the time the water has passed through both storage tanks and reaches the guest rooms. More so whenever the HVR is supplying its fresh water needs from the creek adjacent to the hotel, it is very likely that this water is contaminated.

The composition of solid waste generated in hotels is classified as domestic and consists mainly of food, glass, plastic, metal, paper and organic waste.

To reduce the amount of waste that is generated by its operation and minimize the environmental impact, the hotel could consider the following measures:

Reduction
As a first step to reduce the amount of waste generated in its operation, the hotel should review its purchasing decisions, taking into account environmental aspects by giving preference to:

- Environmentally friendly products and chemicals
- Products sold in bulk or concentrate (to reduce packaging)
- Products sold in refillable containers or reusable packaging
- Products with a minimum amount of packaging
- Products made from or contain recycled materials
- Products that are reusable and durable (instead of disposable)
- Products manufactured locally

Reuse
Whenever possible the hotel should reuse items in their original form for the same or a different purpose rather than disposing them. Examples of standard reuse measures for hotels:

- Only serve beverages that are packaged in refillable bottles or kegs that can be returned to the supplier.
- Use the back side of computer and office paper to print draft documents or internal memos.
- Give preference to vendors that supply their products in returnable or refillable containers.
- Replace the plastic liners that are used in guestroom garbage bins only when they are soiled or unsuitable for further use.

Recycling and composting
The HVR separates glass and plastic bottles. Both items are collected by individuals that supposedly reuse or recycle the bottles. Although there exists no formal recycling infrastructure in the Tropics of Cochabamba, the hotel could consider contacting recycling services in Cochabamba to investigate requirements for companies to accept recyclable products from Villa Tunari and the region.[7]

Although the HVR keeps garden waste separate and allows for natural decomposing on property, the hotel could consider setting up a compost site to use the compost gained from a more actively managed decomposing process to enrich (fertilize) the soil in its gardens. Once

[7] The currently planned landfill site could serve as collection and storage center for recyclables to reach economically viable volumes for a recycler.

the compost site for grass clippings and leaves is operational, the HVR could introduce organic waste from its kitchen such as fruit and vegetable leftovers.

Toxic or hazardous products
Most important the HVR should separate hazardous waste products and deliver them to adequate disposal systems or sites. For example, Cochabamba has a project that offers its citizens containers to dispose of old batteries. The containers are located in central locations such as supermarkets or office buildings.

As used batteries do not take up much space and the owner commutes fairly regular between Villa Tunari and Cochabamba, the batteries used in the hotel could be disposed of at a battery collection site in Cochabamba. Other hazardous waste includes:

- Oil filters of vehicle or any other motor-driven equipment
- Mineral oil (motor oil) and vegetable oil (from kitchen operations)
- Rugs soaked with oil
- Fluorescent lamps
- Car batteries
- Electromagnetic or electronic ballasts of fluorescent light tubes
- Spray paint or insecticide cans

Most of these waste items do not take up much volume, but they have great potential for contaminating the subsurface when buried. Therefore the HVR should consider separating these items, storing them in appropriate containers, and transporting them to Cochabamba where the city operates an adequate sanitary landfill.

4.5 Environmental Management Systems and certification

An Environmental Management System (EMS) is a tool that helps organizations improve their environmental performance by integrating environmentally beneficial actions into their activities, products and services. Hence, an EMS is a system for coordinating, managing and improving processes to help a company achieve its environmental objectives.

In past years an increasing number of tourist sector companies and hotels have implemented an EMS to improve their environmental performance, reduce operating cost, ensure regulatory compliance, improve public image and market opportunities, increase customer satisfaction and improve staff motivation.

In the case of the Hotel Victoria Resort, the implementation of an EMS would entail the integration of environmental efforts with additional Best Practices (some are mentioned above) and the design of all activities according to the main components of an EMS.

Once the EMS has been implemented many companies are interested in certifying their system against a standard that is defined by an outside organization. There are several recognized standards, although the only globally available at the moment are ISO 14001 and Green Globe 21. While ISO 14001 is applicable to any kind of industry (manufacturing, services etc), Green

Globe 21 is dedicated exclusively to help the travel and tourism industry to develop a sustainable way of operation. Detailed information is available at www.greenglobe21.com.

4. 6 Project ideas towards mitigation of environmental impacts

The Hotel Victoria Resort case study has identified several opportunities that would greatly improve the environmental performance of the hotel and reduce the environmental impact caused by its operation.

The HVR could ask for assistance to implement the following initiatives:

Best Practice training work shop
Various opportunities identified in the case study to mitigate environmental impacts are in the area of energy, freshwater, wastewater and solid waste management. The application of Best Practices in hotel operations will help the HVR to profit from the introduction of new or the improvement of existing standard operating procedures.

The Hotel Victoria Resort could request Best Practice training in form of, e.g., a five-day work shop that would address environmental awareness as well as all hotel operations.

Best Practice training could be extended to all members of the Villa Tunari Hotel Association (Ashtropic) to reach a bigger number of hotel and accommodation facilities. This training could include national institutions, such as the National Cleaner Production Center (Centro de Promoción de Tecnologías Sostenibles, CPTS). The CPTS could apply the materials and lessons learned from the workshop to hotel and tourism businesses of other tourist destinations in Bolivia.

Special focus within the Best Practice training should be given to health and safety issues, such as fresh water quality and electrical installations as well as hazardous waste management.

The implementation of most Best Practices is low cost and achieves considerable improvements in environmental performance.

Separation of gray and black wastewater drainage
Depending on a review of the actual design and installations of the sanitary drainage system with the objective to establish the feasibility of separate treatment of gray and black wastewater, the Hotel Victoria Resort could request assistance to carry out modifications in the existing sanitary drain installations. As a result, gray wastewater would be fed into a separate system of treatment filters. This would greatly reduce the amount of wastewater contaminated with pathogens and nutrients and lower the load on the existing septic tanks.

Installation of solar water heaters
Although solar water heaters are widely used in the city of Cochabamba, the application in the Tropics of Cochabamba requires an initial feasibility study to ensure that climate conditions allow for a successful operation of solar collectors. This information or data might be available with local solar companies that have done work in the region or local research institutions. Prior

to requesting assistance to install solar water heaters, the HVR should establish if using solar water heaters is viable.

Appendix I - Case Study Checklist

Diagnóstico Ambiental - Formato de recolección de datos

1. Datos generales

1.1 Nombre y dirección de la propiedad_____

_____

1.2 Teléfono_____ Número de fax_____

1.3 Correo electrónico_____

1.4 Nombre del gerente general_____

1.5 Persona que proporciona la información_____

1.6 Número de empleados que trabajan en la propiedad _____fijos_____temporales

1.7 Fecha de inauguración de la propiedad (fecha y tipo de ampliaciones)

1.8 Superficie total de la propiedad (metros cuadrados) _____m2

De ésta, ¿cuántos metros son construidos?_____m2

1.9 ¿Existe información o folletos sobre excursiones o atracciones? sí no

¿Cuáles son las giras promocionadas por el hotel?

¿Cuáles excursiones son organizadas por el hotel?

2. Infraestructura (contesta n/a a preguntas que no aplican)

2.1 ¿Hay cocina? sí no

Inspección visual, ¿condición? bien limpio no muy limpio NQCA

¿Se realizan inspecciones de salud? sí no

¿Tiene certificado sanitario o de salud e higiene? sí no

¿La cocina cuenta con trampa de grasa? sí no

2.2 ¿Hay restaurante? sí no

¿Qué capacidad tiene? _____personas ____platos servidos/mes

¿El menú ofrece platos de carne de montaña? sí no

¿Se cumple con las temporadas de veda (carne y pescado)? sí no

2.3 ¿Existen instalaciones para huéspedes (tienda, alberca, otra)?_____

2.4 ¿Existen baños públicos? sí no ¿Cuántos?_____
¿Hay baños para empleados? sí no

3. Información sobre las habitaciones

3.1 Número total de habitaciones _____

3.2 PAX a 100 por ciento de ocupación (número máximo de huéspedes) _____

3.3 Usa la siguiente tabla para proporcionar información de las habitaciones de la propiedad

Categoría o tipo de habitación	# de habitaciones en cada categoría	Cocina (S/N)	# de baños en cada habitación (a)	Máximo # de huéspedes por habitación	Habitaciones equipadas con: aire acondicionado mini-split unidad de ventana frigobar televisión, etc.
Nota: (a): Usa ½ para documentar baños con solamente inodoro y lavabo.					

4. Agua (contesta n/a a preguntas que no aplican)

4.1 ¿Cuáles son las fuentes de agua potable y cuál es el uso final que tiene el agua de cada una? (Por ejemplo: Pozo – para la piscina; Red municipal – consumo general del hotel; Agua residual tratada – riego)

Usos	**Procedencia**				
	Pozo	Superficial	Red	Otra	Volumen total m3/día
Sanitario o consumo general					
Piscina					
Lavandería					
Riego					
Volumen total m3 / día					

4.2 ¿Existe un sistema de tratamiento de agua? sí no
¿De qué tipo es el tratamiento?_____

4.3 ¿Toman pruebas para el análisis de la calidad del agua potable? sí no

4.4 ¿Existen conexiones entre la propiedad y la red municipal? sí no

4.5 ¿Existen medidores y sub-medidores en la propiedad? sí no

Indica la ubicación_____

4.6 ¿Existen tanques (pozos) de agua? sí no

¿Dónde están ubicados?_____

Elevación: _____m

¿Existen bombas para distribuir agua a las habitaciones? Sí no

En el caso de que sí, indica la presión con que trabajan las bombas_____

Aguas servidas

4.7 Explica el tipo de tratamiento y el método de descarga para manejar los aguas residuales generadas por las diferentes áreas. (Por ejemplo: agua residual de la lavandería es filtrada y usada para el riego; aguas residuales de las cocinas pasan por una desgrasadora (trampa de grasa) y corren a un tanque séptico; las aguas residuales del hotel son acumuladas en un cárcamo y son descargadas al drenaje municipal o a la planta de tratamiento)

Origen de las aguas residuales	**Manejo y tratamiento**				
	Drenaje y cárcamo	Fosa séptica	Alcantarillado municipal	Descarga al ambiente	
Habitaciones					
Cocina					
Lavandería					
Piscina					
Volumen total m3 / día					

4.8 Averigua las medidas para conservar agua

- Programa de prevención y detección de fugas: sí no
- Aereadores en la mayoría de las llaves de agua sí no
- Regaderas de bajo caudal en los baños de las habitaciones y del personal (máx. 9.5 litros por minuto): sí no
- Tanques de inodoros de 1.6 gallones (6 litros) en los baños de los huéspedes, baños públicos y de empleados sí no
- Dispositivos de ahorro de agua en tanques de inodoros tradicionales sí no

O Uso de aguas pluviales: sí no

5. Energía (contesta con n/a a preguntas que no aplican)

5.1 ¿Cuál es la fuente de energía eléctrica (red municipal, generadores)?

5.2 ¿Existe un medidor? sí no

En el caso de que sí, ¿dónde está ubicado?

5.3 ¿Existen tanques de gas LP o de diesel? Gas sí no Diesel sí no

Indica ubicación y si cuenta con un muro de contención_____

5.4 Capacidad y frecuencia de la planta de emergencia_____

5.5 Descripción del tipo de aire acondicionado (mini-split, unidad de ventana) usado en las siguientes áreas:

Habitaciones	sí	no	M/S	Ventana
Áreas para huéspedes	sí	no	M/S	Ventana
Tiendas	sí	no	M/S	Ventana
Oficinas	sí	no	M/S	Ventana
Áreas de servicio	sí	no	M/S	Ventana

5.6 Descripción de las fuentes principales de energía — energía eléctrica (EE), Gas LP, diesel (D), solar (S) — consumidas por las siguientes instalaciones:

Cocinas (horno, freidora)_____

Calentadores de agua para habitaciones_____

Calentadores de agua en las áreas de servicio_____

Secadores en la lavandería_____

5.7 ¿Hay lavandería? sí no

Descripción de los equipos usados en la lavandería

Lavadoras_____
Secadores_____
Planchas_____
Otros_____

5.8 Medidas para conservar energía

O Mantenimiento preventivo documentado para todos los equipos grandes

- O Calentadores solares para agua
- O Sistema de manejo de energía de los a/c en las habitaciones
- O Ventiladores y ventanas que sirven como ventilación natural en las habitaciones
- O Focos ahorradores en áreas de servicio y en los jardines
- O Focos ahorradores en áreas públicas y habitaciones
- O Aislamiento eficiente de habitaciones y de áreas con aire acondicionado
- O Política de apagar el aire acondicionado durante la limpieza de las habitaciones

6. Residuos sólidos

6.1 ¿Qué cantidad de residuos sólidos genera la propiedad y dónde dispone sus residuos sólidos?

Tipo de residuo	Generación diaria	Reciclaje o composta	Donde se deposita al final
Orgánico			
Inorgánico			

¿Existe separación de los siguientes residuos, y ¿quién se los lleva?

Cristal	sí	no
Plástico	sí	no
Papel / Cartón	sí	no
Aceite vegetal	sí	no
Aceite mineral (de vehículos)	sí	no
Otro	sí	no

6.2 ¿Se sigue las siguientes medidas para reducir la cantidad de residuos sólidos?

- O Composta para los desechos verdes del jardín y de las cocinas
- O Donación de desechos de alimentos a granjeros locales para comida de animales
- O Uso de dispensadores rellenados para jabón y champú en los baños de las habitaciones
- O Reducción de productos empacados en porción (cereal, azúcar, mermelada, mantequilla)
- O Otros_____

7. Productos peligrosos

7.1 ¿Se utilizan pesticidas en la propiedad? sí no

7.2 ¿Qué cantidad de pesticidas se consume por mes (por año)?_____litros

7.3 Nombres y fabricantes de los pesticidas e ingredientes principales

_____

7.4 ¿Qué productos de limpieza se utilizan (cloro, ácido muriático, otros)?

8. Ocupación, agua y energía

8.1 Utiliza la siguiente tabla para documentar los datos de ocupación en términos de huésped-noche por mes y cuartos ocupados–noche por mes. Esta información debe incluir cortesías y cuartos ocupados por empleados o empleados de la empresa

Ocupación del hotel para el período de la línea base					
	Mes y año	Cuartos noches disponibles	Cuartos noches - ocupados (incl. Cortesías)	PAX o huésped noches (incl. cortesías)	% Ocupación
1 – 12					
2					
3					

8.2 Utiliza la siguiente tabla para proporcionar el consumo de agua total y el costo para los 12 meses del período de la línea base.

Mes y año	Total de consumo de agua (indica unidades) _____/mes	Costo total (indica unidades) _____/mes
Enero		

8.3 Utiliza la siguiente tabla para proporcionar el consumo de energía eléctrica total y el costo para los 12 meses del período de la línea base.

Mes y año	Total de consumo de energía eléctrica kWh/mes	Costo total (indica unidades) _____/mes
Enero – Diciembre		

ANNEX 5

Guiding USAID and GOB Regulations and Procedures

A. Guiding USAID Regulations

USAID environmental requirements derive from the Code of Federal Regulations, specifically 22 CFR part 216, the Agency Environmental Procedures. These represent the agency implementation requirements of U.S. Environmental regulations for program implementation as contained in:

- The Foreign Assistance Act of 1961 as amended
- Council of Environmental Quality Regulations (1978) under the National Environmental Policy Act (42 U.S.C 4371)
- Executive order (E.O.) 11514 (1970), Protection and Enhancement of Environmental Quality as amended by E.O. 11991 of 1977

The Agency Environmental Procedures are designed to present a tiered assessment system that with macro-level assessments will cascade through a series of increasingly detailed requirements based on the assessment's findings. These procedures prescribe how environmental issues will be taken into account for specific activities and how the environmental analysis will be accomplished. They include:

- **Initial Environmental Examination (IEE) –** This is the first action taken by the USAID Mission in a country or region to review the reasonably foreseeable effects of a proposed action (or group of actions) on the environment. The purpose of the IEE is to gather basic pertinent information on the environment and the actions. This information is analyzed and organized into a brief environmental statement describing the situation. This brief statement serves as the factual basis for the USAID Bureau Environmental Officer (BEO) Environmental Threshold Decision on the action(s).

- **Environmental Threshold Decision (ETD) –** This is the formal USAID decision which uses the information contained in the IEE to determine whether a proposed action is a major action significantly affecting the environment. Threshold decisions can result in a categorical exclusion, a negative determination or a positive determination.

- **Positive Determination** – This is given to actions determined to be major actions significantly affecting the environment. The positive determination signifies that action must be taken by the Agency (mission) to define procedures that identify and mitigate adverse environmental impacts for this category of actions. To accomplish this, the positive determination may request that an environmental assessment (EA), an environmental impact statement (EIS), or a programmatic environmental assessment (PEA) be conducted before the major action is implemented.

- **Categorical Exclusion** – This is issued to actions that fall under certain criteria described in USAID regulations 216. These actions are exempted from the need to

perform an Environmental Assessment or Impact Statements. Conditions of extreme emergency, activities in training or education are types of activities that can be given a decision of Categorical Exclusion.

- **Negative Determination** – This is given to actions determined not to be major actions significantly affecting the environment. This determination can be given to actions that are small, local in scope, and are adequately addressed with respect to environmental impact by Agency (Mission) procedures.

- **Environmental Assessment** – This is a detailed study of the reasonably foreseeable significant effects, both positive and negative, of the proposed action on the environment of a foreign country or countries. Its purpose is to provide USAID and host-country decision makers with a full discussion of the significant environmental issues and effects of the proposed action(s). Environmental assessments can be prepared for activity types, for programs of similar activities and for specific sites.

- **Environmental Impact Statement** – Performed for actions that are determined to significantly affect the global environment or areas outside the jurisdiction of any nation (e.g., oceans), the environment of the United States, or other aspects of the environment at the discretion of the Administrator. It is a specific document with a definite format and content provided in National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) regulations. The actions undertaken in the tourism and eco-tourism facilities and activities in the Chapare Region will not warrant an EIS.

- **Programmatic Environmental Assessment (PEA)** – The PEA is conducted to assess environmental effects of individual actions and their cumulative environmental impact in a given country or geographic area, or the environmental impacts that are generic or common to a class of agency actions, or other activities not country-specific. To the extent practicable, the form and content of the PEA should be the same as for project assessments. Supplemental EA on major individual actions are necessary where follow-on or subsequent activities may have significant environmental impacts on countries where such impacts have not been adequately evaluated in a former study.

- **Environmental Management System** – The entire process is described by the 22 CFR 216 procedures and designed for a particular action or set of actions resulting in a set of guidelines, processes, decision-making nodes and assignments of roles and responsibilities.

B. Guiding Government of Bolivia Laws, Treaties and Regulations

B.1 International Treaties

Bolivia is signatory to 10 pertinent international environmental treaties. Particularly important, as it pertains to the CPA, are the Conventions on Biodiversity, CITES, and the International Tropical Timber Agreement. These treaties promote the management of natural resources using non-renewable strategies and elicit the prohibition of practices which result in the permanent loss of biological resources.

The significant environmental treaties to which Bolivia is a signatory are summarized in Table 5.1.

Table 5.1 Bolivia's Significant International Environmental Treaties

Treaty Name	Objective	Entered into Force
Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal	To reduce trans-boundary movements of wastes, subject to the Convention, to a minimum consistent with the environmentally sound and efficient management of such wastes; to minimize the amount and toxicity of wastes generated and ensure their environmentally sound management as closely as possible to the source of generation; and to assist LDCs in environmentally sound management of the hazardous and other wastes they generate	5-May-92
Convention on Biological Diversity	To develop national strategies for the conservation and sustainable use of biological diversity	29-Dec-93
Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES)	To protect certain endangered species from overexploitation by means of a system of import/export permits	1-Jul-75
Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar)	To stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value	21-Dec-75
International Tropical Timber Agreement, 1994	To ensure that by the year 2000, exports of tropical timber originate from sustainably managed sources; to establish a fund to assist tropical timber producers in obtaining the resources to reach this objective	1-Jan-97
Kyoto Protocol to the United Nations Framework Convention on Climate Change	To further reduce greenhouse gas emissions by enhancing the national programs of developed countries aimed at this goal and by establishing percentage reduction targets for the developed countries	Not yet in force
Montreal Protocol on Substances That Deplete the Ozone Layer	To protect the ozone layer by controlling emissions of substances that deplete it	1-Jan-89
Protocol of 1978 Relating to the International Convention for the Prevention of Pollution From Ships, 1973 (MARPOL)	To preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimization of accidental discharge of such substances	2-Oct-83
United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa	To combat desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership arrangements	26-Dec-96
United Nations Framework Convention on Climate Change	To achieve stabilization of greenhouse gas concentrations in the atmosphere at a low enough level to prevent dangerous anthropogenic interference with the climate system	21-Mar-94

B.2 National Laws, Decrees, and Regulations

Three principal laws guide the environmental process in Bolivia:

- Law N^{o} 1333, 1992, General Law for the Environment
- Supreme Decree N^{o} 24781, General Regulations for Protected Areas
- Law N^{o} 1700, 1996, Forestry Law

The most significant of these is the General Law for the Environment which prescribes the system for environmental management for the country.

B.3 General Law for the Environment

Bolivia's Public Law 1333 (Ley de Medio Ambiente – April 27, 1992) contains the country's environmental and natural resources protection regulations. The law regulates the impact of human activities on the environment and promotes the sustainable development of activities designed to improve the population's quality of life.

The law requires all public and private projects involving activities with the potential to cause negative impacts to undergo an environmental review and to develop mitigation measures to minimize these impacts. The law states that no public or private project involving these potentially impacting activities can be started without an environmental license. The environmental review process is initiated by classifying projects according to their degree of environmental risk.

The law outlines the environmental jurisdiction of the different territorial authorities. At the National Level, it is the responsibility of the Vice Ministry of the Environment to intervene in projects that cross international or departmental boundaries. At the Departmental Level, it is the responsibility of the respective prefecture government to intervene in projects that cross Municipal boundaries. At the Municipal level, enforcement of environmental regulations is within the competence of the Municipal authority.

Since decentralization in 1999, Bolivian municipalities have become the fundamental administrative territorial entity of the GOB. The central government has transferred to the local municipalities a range of responsibilities designed to strengthen local government models, thus legally encouraging citizen's participation in social control.

For projects or facilities, public and private, involving activities with the potential to cause negative impacts, the owner must file a Declaration of Environmental Adequacy (DAA) with the Dirección de Recursos Naturales y de Medio Ambiente (DRN). The DAA contains information on the facility's operations and practices, and presents a plan designed to mitigate or eliminate any potential environmental impacts that its operations may be causing to the environment. The DRN reviews the declaration and, if found acceptable, issues the environmental license.

Articles 103 and 104 of the law regulates the content of the Environmental Manifest (EM) and of the Plan for Environmental Mitigation. The EM should contain:

1. Information about the project or activity
2. Description of the natural and physical environment around project
3. Description of the generation and emission of contaminants
4. Applicable legislation
5. Identification of deficiencies and effects
6. Mitigation plan, if applicable
7. Sworn declaration
8. Annexes
9. Risk analysis and contingency plan, if applicable

C. Required Program Procedures and Consultations

The primary objective of these program procedures is to provide USAID implementing partners with a guiding tool to ensure that all USAID-funded tourism program activities are sustainable from the social and environmental standpoint, and that they do not cause negative impacts on the environment and natural resources.

With this in mind, the PEA developed a guidance manual to be used as a comprehensive model for other possible tourism, eco-tourism or private sector projects that may arise for future consideration funding by any funding source.

The manual, which serves as a consulting and orientation tool in all phases of a project, includes:

- GOB environmental regulations and permits requirements
- USAID environmental regulations and requirements
- Conditions under which a site-specific environmental assessment will be required
- Best Practices for construction and operations
- Links between environmental mitigation and the monitoring plan

The guidelines have been designed to identify problems and/or possible impacts during project planning, design, construction and operation and to help the user evaluate and propose mitigation measures or further study for these problems or impacts. This process is described in the instructions that accompany the guidelines.

The guidelines cover the applicability of GOB environmental assessment procedures to the activity. They also allow the collection of information that is used to determine whether the activity is subject to a site-specific environmental assessment.

The guidelines outline the GOB environmental regulations applicable to the tourism and eco-tourism activities under the USAID proposed program and describes how these environmental review procedures are to be integrated into the set of guidelines and procedures developed by the PEA.

C.1 Environmental Review Integration

The Government of Bolivia environmental review procedures and permit requirements are integrated (Figure 5.3, page 126) into the set of procedures developed by the PEA as follows:

The GOB information, documents, forms and requirements will be included in the Instructions Section of the PEA environmental guidelines.

The GOB initial determination for exclusion as well as the completion of the Declaration of Environmental Impact, if necessary, will be performed by the implementing partner in direct coordination with and subject to review by the Mission Environmental Officer and/or his/her designee.

The environmental checklist section of the approved guidelines will have questions regarding the review of GOB environmental requirements and its outcome in order to provide information to the USAID reviewing officer that GOB environmental requirements have been considered.

In all instances, the person completing the environmental guidelines should be someone with an adequate level of education that will allow them the use and interpretation of the information required to prevent the recollection of irrelevant and inconsistent data.

In that sense, throughout the duration of the project, USAID should organize periodic workshops to capacitate USAID CTOs, NGOs, and other implementing partners regarding their environmental monitoring responsibilities, what they must do to comply with USAID and GOB regulations, and how to use the environmental guidelines.

These guidelines and requirements should be updated yearly to implement any changes in GOB/USAID environmental requirements and changes in mitigation measures as a consequence of recommendations from monitoring.

In cases where the DNR requires an EIA, it would be advisable to have USAID as an active participant of the process and contributor of the funds to cover the expenses.

C.2 Conditions for Site-Specific EA

According to USAID Environmental Procedures, Regulation 216.2(d)(1), the following activities generally require a site-specific environmental assessment:

ACTIVITY	ACTIVITY
River basin development	Resettlement projects
Irrigation or water management	Penetration road building or road improvement
Agricultural land leveling	Power plants
Drainage projects	Industrial plants
Large scale agricultural mechanization	Potable water/sewerage other than small scale
New lands development	

If any of the project activities under the program contain any of the above sub-activities, a site-specific environmental assessment shall be required before any action related to the identified sub-activity can begin. An amended IEE detailing the need for a site-specific environmental assessment shall be submitted to the LAC BEO for approval and terms of reference.

Other conditions under which a site-specific EA will be required include:

- All activities involving earthmoving or construction of physical works;
- All additional or substantially modified sub-activities, which were not considered in the IEE and/or the environmental assessment checklist, and the MEO identify potentially significant negative environmental impact(s);
- Activities for which mitigation measures established in the environmental guidelines are not achievable or have been shown, through the monitoring plan, to be insufficient to prevent a significant environmental impact;
- Activities for which the GOB environmental regulations and permit requirements call for a site-specific environmental assessment;
- Any activity or project appear to present a potentially substantial adverse environmental effect but requires more analysis to make a definite conclusion;
- Any activity for which the BEO threshold decision calls for it.

Again, if any of these conditions will require a site-specific environmental assessment before any action related to the identified activity can begin, an amended IEE detailing the need for a site-specific EA shall be submitted to the LAC BEO for a threshold decision.

C.3 Site-Specific Environmental Assessment Criteria

The purpose of a site-specific environmental assessment is to "*provide USAID and host country decision makers with a full discussion of significant environmental effects of the proposed action.*" According to USAID Regulations 216, the EA should be based upon a "SCOPING STATEMENT" and address the following elements:

1. **Summary –** The summary shall stress the major conclusions, areas of controversy, if any, and the issues to be resolved.

2. **Purpose –** The Environmental Assessment shall briefly specify the underlying purpose and need to which the Agency is responding in proposing the alternatives including the proposed action.

3. **Alternatives including proposed action –** This section should present the environmental impacts of the proposal and its alternative in comparative form, thereby sharpening the issues and providing a clear basis for choice among options by the decision maker.

4. **Affected environment –** The Environmental Assessment shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration.

5. **Environmental consequences –** This section forms the analytic basis for the comparisons under paragraph (c) (3) of this section. It will include the environmental impacts of the alternatives including the proposed action; any adverse effects that cannot be avoided should the proposed action be implemented; the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity; and any irreversible of irretrievable commitments of resources which would be involved in the proposal should it be implemented.

6. **List of Preparers –** The Environmental Assessment shall list the names and qualifications (expertise, experience, professional assessment background papers, discipline) of the persons primarily responsible for preparing the Environmental Assessments.

The environmental checklist/questionnaire in the guidelines will gather the information necessary for the MEO to decide on the site's exclusion or eligibility for a site-specific environmental Assessment.

Figure 5.3 details the entire USAID Environmental Review Procedure designed by the PEA.

5.3.4 Other Standards

During the implementation of alternative development activities, including tourism and eco-tourism activities, it is likely that USAID will coordinate with other donor entities that have their own environmental review procedures. Therefore, this PEA recommends that the following steps be taken to ensure proper coordination between the mission and other donor partners:

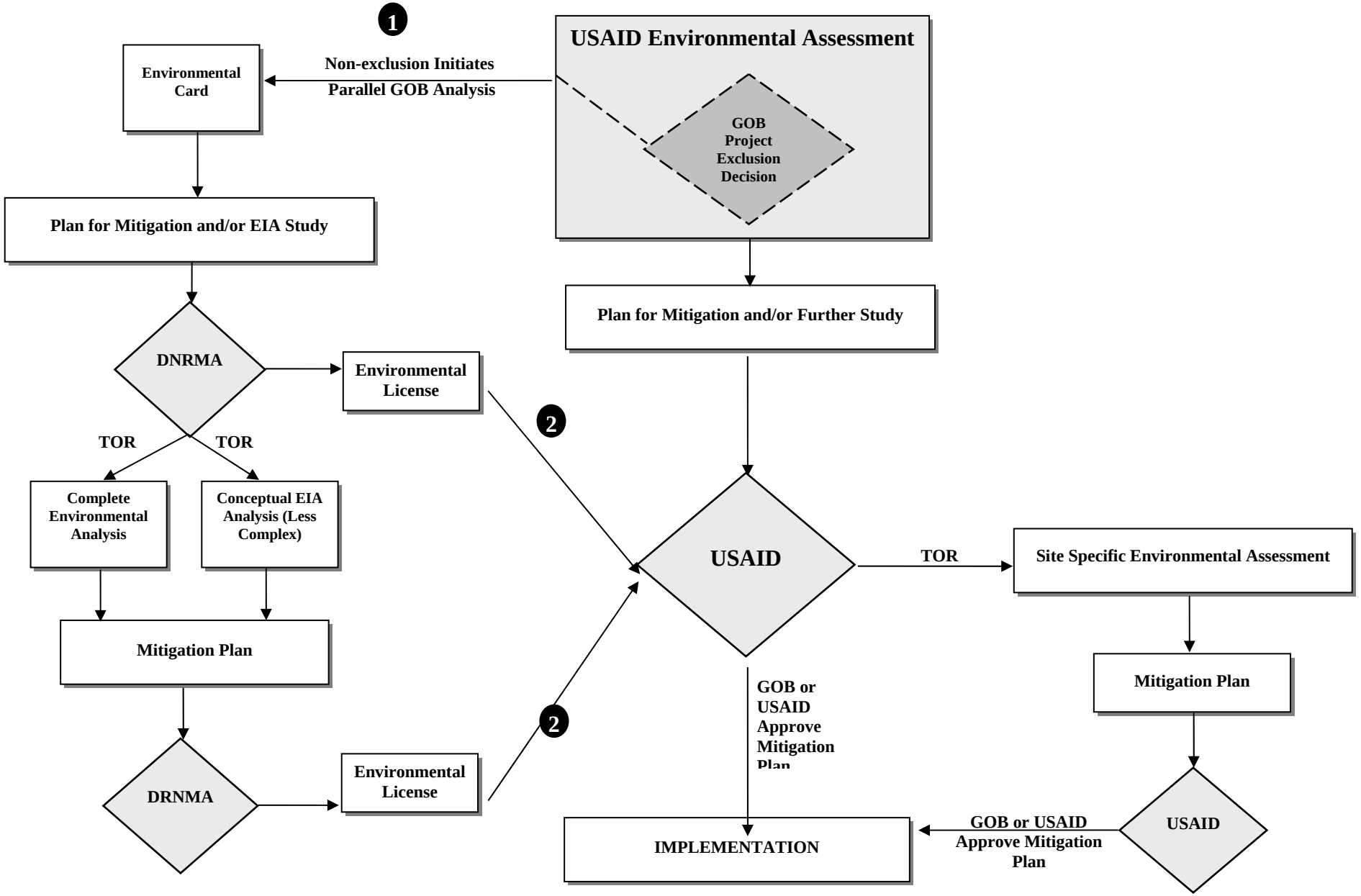
- Assess whether USAID is a "minor donor" in the project as defined in 22 CFR 216.1(12). As a minor donor (both under $1,000,000 and less than 25 percent of the estimated project cost, with no control of planning or design) USAID has no control over the use or non-use of environmental review procedures;

- If USAID contributes more than $1,000,000 but this is less than 25 percent of the estimated project budget, the mission environmental officer must determine whether the environmental review procedures used by the partner organization for the project in question are adequate;

- If USAID is involved in planning and design and/or contributes over 25 percent of the estimated budget for a project, USAID Guidelines must be followed or the Guidelines of the partner must, in the judgment of the mission environmental officer be implemented to the same standard as the USAID guidelines.

It is highly recommended that even as a minor donor USAID work with the other partners to ensure that environmental reviews are conducted in good faith. The Mission should ensure that "minor donor" status does not become a mechanism for moving resources outside of mission environmental guidelines.

Figure 5.3 Required Environmental Procedures and Consultations



ANNEX 6

Persons Contacted During the Development of the PEA

No.	First Name	Last Name	Stakeholder Category	Organization	JobTitle	City	Phone	Mobile Phone	Email Address
1	---	---	Hotels/Lodging	Hotel Ambaró	Administrative Personnel	Buena Vista	---	---	---
2	---	---	Hotels/Lodging	Hotel Victoria Resort	Administrative Personnel	Villa Tunari (40 Arroyos)	591-717-36991		hvr@victoria-resort.com
3	---	---	Indigenous Communities	CPITCO (Coordinadora de Pueblos Indígenas del Trópico de Cochabamba)	Members of Board	Cochabamba	591-412-1861		
4	---	---	Hotels/Lodging	Hotel "Jichi"	Adminstrador				
5	---	---	Hotels/Lodging	Hotel "Amazonas"	Adminstrador				
6	---	---	Hotels/Lodging	Hotel "El Puente"	Adminstrador				
7	---	---	Hotels/Lodging	Hotel "Las Palmas"	Adminstrador	Villa Tunari			
8	Fabián	Aguirre	USAID	USAID/Bolivia	CTOR, Alternative Development	Obrajes			
9	Ricardo	Alem	USAID Contractor	FDTA-Valles and MAPA projects (USAID), Chemonics	Ag specialist	Cochabamba	+591 (-4) -452-5160, 411-5056	+591-717-06528	ralem@fdta-valles.org
10	Roberto	Alem	Tourism (Potential)		Videographer/ Photographer			591-717-95709	
11	Luis	Ampuero Ramos	USAID Alternative Development Project Contractor	DAI-CONCADE	Asesor en Políticas	Cochabamba	+591 (-4) -425-1655, 425-2096, 453-0354, 453-0149, 453-0278	591-717-21842	luis_ampuero@dai.com
12	Daniela	Andia	International Donor-Supported Natural Resources Project	Proyecto "Jatun Sach'a". AD/BOL/97/C23 (C23/FAO)	Environmental Specialist	Chimoré			

No.	First Name	Last Name	Stakeholder Category	Organization	JobTitle	City	Phone	Mobile Phone	Email Address
13	Demis	Andrade	International Donor-Supported Natural Resources Project	Proyecto Forestal AD/BOL/97/C23 (C23/FAO)					
14	Ronald	Anzoleaga	USAID Alternative Development Project Contractor	DAI-CONCADE	Asesor	Cochabamba	+591 (-4) -425-1655, 425-2096, 453-0354, 453-0149, 453-0278	591-717-21842	
15	Oswaldo	Aramayo	Government Counterpart, National Parks	Carrasco Parque Nacional, Servicio National de Areas Protegidas (SERNAP)	Director, Carrasco Parque Nacional	Cochabamba	591-4-448-6452, -6453	+591 (-717) -95674	
16	Joe	Blubaugh	USAID Alternative Development Project Contractor	DAI-CONCADE	Grants Manager				
17	Bruce	Brower	USAID Contractor	FDTA-Valles and MAPA-Yungas projects (USAID), Chemonics	Jefe de Equipo	Cochabamba	+591 (-4) -452-5160, 411-5056	591-717-43048	bbrower@fdta-valles.org
18	Victor	Bullen	USAID	USAID/Bolivia, Oficina de Medio Ambiente	Regional Environmental Advisor, USAID/Bolivia	La Paz	591-2-278-5548		vbullen@usaid.gov
19	René	Bustamante	Tourism (Potential)	EMCOPAIVI (Empresa Comercializadora de Productos Agropecuarios de Ivirgarsama)	Encargado de Producción	Ivirgarzama			
20	Jorge	Calvo	USAID	USAID/Bolivia	CTOR, MAPA project	Obrajes			jcalvo@usaid.gov
21	Boris	Carrillo	Municipality/Local Government	Distrito No. 4 del Municipio de Villa Tunari	Encargado de Turismo				
22	Luis	Choque	Medical Services	Hospital General de Chimoré	Médico Residente				

No.	First Name	Last Name	Stakeholder Category	Organization	JobTitle	City	Phone	Mobile Phone	Email Address
23	Oscar	Coca	Municipality/Local Government	Mancomunidad de Municipios del Trópico de Cochabamba	Director Ejecutivo				
24	Gregorio	Cordova	Government Counterpart, National Parks	Puerto Aroma Guardpost, Carrasco National Park	Park Ranger	Puerto Aroma			
25	Carlos	de Ugarto	International Donor-Supported Natural Resources Project	Proyecto GEF/Banco Mundial, SERNAP (Servicio Nacional de Areas Protegidas	Especialista, Datos y Mapas (SIG)	La Paz	591-2-243-4420, -4472		
26	Hellmyn	Delfin de Morávek	Government Counterpart, Tourism	Viceministerio de Turismo, Ministerio de Desarrollo Económico, Bolivia	Directora General de Turismo	La Paz	591-2-237-5129, 235-2479		hmoravek@hotmail.com
27	Richard	Fisher	USAID	USAID/Cochabamba, Bolivia	Coordinador Regional, Oficina de Desarrollo Alternativo	Cochabamba	+591 (-4) -423-3992,4-425-0155, 4-423-3597		rfisher@ad.concade.net
28	José	Flores	Government Counterpart, National Parks	Puerto Aroma Guardpost, Carrasco National Park	Park Ranger	Puerto Aroma			
29	Torsten	Frisk	International Donor-Supported Natural Resources Project	Proyecto "Jatun Sach'a". AD/BOL/97/C23 (C23/FAO)	Acting Director, C23, Bolivia. ALSO:Ex. Oficial Principal Forestal (FAO).	Cochabamba	591-4-428-0801, -424-8124		Torstenfrisk@tierra.cl
30	Elba	Garcia Viuda de Daxa	Hotels/Lodging	Hostal:Cabaña Los Jazmines	Owner	Ivirgarzama		591-717-63226	
31	Carlos	Hinajosa	Hotels/Lodging	Chapare Tropical Resort (CTR)	Partner, CTR. Formerly, construction oversight manager.	Chimoré		+591-717 -29119	bilyhino@hotmail.com

No.	First Name	Last Name	Stakeholder Category	Organization	JobTitle	City	Phone	Mobile Phone	Email Address
32	José	Isategua Guaguasu	Indigenous Communities	CPITCO (Coordinadora de Pueblos Indígenas del Trópico de Cochabamba)	Presidente	Cochabamba	591-412-1861		
33	Morris	Israel	USAID	USAID/Bolivia, Oficina de Medio Ambiente	Especialista Ambiental y en Recursos Hídricos	La Paz	591-2-278-5548		misrael@usaid.gov
34	Erwin	Jimenez	Indigenous Communities	CPITCO (Coordinadora de Pueblos Indígenas del Trópico de Cochabamba)	Asesor	Cochabamba	591-412-1861		
35	Rally	Lacy	USAID Contractor	FDTA-Valles and MAPA-Yungas projects (USAID), Chemonics	Project Administrator. Deputy COP?	Cochabamba	+591 (-4) -452-5160, 411-5056		
36	Máximo	Liberman Cruz	International Donor-Supported Natural Resources Project	Proyecto GEF/Banco Mundial, SERNAP (Servicio Nacional de Áreas Protegidas	Coordinador Proyecto	La Paz	591-2-243-4420, -4472		mliberman@sernap.gov.bo,
37	Salvador	Lobo Clavos	Government Counterpart, Tourism	Unidad Departamental de Turismo, Cochabamba	Director	Cochabamba	591-4-422-1793? 442-1793?	591-707-65340	
38	Roberto	Méndez Torrico	NGO	PROMIC (Programa de Manejo Integral de Cuencas), Cochabamba	Director	Cochabamba	+591 (-4) -429-0729	+591-717-21463	promic@promic.bolivia.org
39	Pablo	Mendoza	USAID Alternative Development Project Contractor	DAI-CONCADE	Especialista de Medio Ambiente	Cochabamba	+591 (-4) -425-1655, 425-2096, 453-0354, 453-0149, 453-0278		
40	Luis	Meneses	USAID Alternative Development Project Contractor	DAI-CONCADE	Especialista de Datos	Cochabamba	+591 (-4) -425-1655, 425-2096, 453-0354, 453-0149, 453-0278	591-717-21842	
41	Humberto	Morales	Municipality/Local Government	Subalcaldia de Tiraque (Shinahota)	Cargo: Comunicaciones y Relaciones Públicas	Shinahota	+591 (-4) -413-6409	591-717-61047	

No.	First Name	Last Name	Stakeholder Category	Organization	JobTitle	City	Phone	Mobile Phone	Email Address
42	Juan José	Munguía	USAID Alternative Development Project Contractor	CHF	Staff Person	Cochabamba		591-717-36701	
43	Meter	Natiello	USAID	USAID/Bolivia	Chairman, Alternative Development Strategic Objective Team	Obrajes	591-2-243-0417, 591-2-278-6544		pnatiello@usaid.gov
44	Julio	Navia Morato	International Donor-Supported Development Project	Proyecto AD/BOL/00E07 Capacitación de Mano de Obra y Promoción de Microempresas en el Trópico de Cochabamba	Coordinator, Microenterprises	Chimoré	591-4-413-6229	591-717-79048	bol07@pino.cbb.entelnet.bo
45	Iván	Nogales	Tourism Activity/Destination	"La Jungla" parque de diversiones	Proprietario				
46	Jorge	Paz	Municipality/Local Government	Distrito Escolar de Villa Tunari	Director				
47	Jorge	Paz Montaño	Municipality/Local Government	Honorable Alcaldía Municipal de Villa Tunari	Encargado de Comunicación Social y Turismo				
48	Miguel	Piaggio	Hotels/Lodging	Ambaró Eco-Resort	Manager	Buena Vista	591-3-332-7840, -932-2048, -342-2372		
49	Silvia	Piérola San Miguel	USAID Alternative Development Project Contractor	DAI-CONCADE	Directora Unidad Información y Tecnología	Cochabamba	+591 (-4) -425-1655, 425-2096, 453-0354, 453-0149, 453-0278	591-717-24579	silvia_pierola@dai.com
50	Andrés	Quiroga	USAID Contractor	MAPA Project (USAID), Chemonics	Ing. Agrónomo,	Cochabamba	+591 (-4) -452-5160, 411-5056		andresquirog@hotmail.com
51	Raúl	Rico	Government Counterpart, Alternative Development	Regional Director, PDAR (Programa Desarrollo Alternativo Regional	Regional Director, PDAR (Programa Desarrollo Alternativo Regional			591-7-173-6303	

No.	First Name	Last Name	Stakeholder Category	Organization	JobTitle	City	Phone	Mobile Phone	Email Address
52	Pablo	Rivera Burgos	Government Counterpart, Tourism	Viceministerio de Turismo, Ministerio de Desarrollo Económico, Bolivia	Técnico Estadísticas, Unidad de Planificación	La Paz	591-2-237-5129, 235-2479		
53	Ernest	Rojas	USAID	USAID/Bolivia	Alternative Development Strategic Objective Team	Obrajes	591-2-243-0417 x3503, 591-2-278-6544	591-715-64897	erojas@usaid.gov
54	Aurelia	Sandoval	Tourism		Flower producer	16 de Julio (Chapare)			
55	Fátima	Sandoval F.	International Donor-Supported Development Project	PRAEDAC (Programa de Apoyo a la Estratégia de Desarrollo Alternativo en el Chapare)	Ecotourism Specialist	Villa Tunari	591-4-413-6508/6567/6568		praedac@pino.cbb.entelnet.bo
56	Christopher	Seeley	USAID Alternative Development Project Contractor	DAI-CONCADE	Director Suplente (Assistant Director). Director del Área de Administración y Operaciones	Cochabamba	+591 (-4) -425-1655, 425-2096, 453-0354, 453-0149, 453-0278		christopher_seeley@dai.com
57	Carla	Siles Soria	USAID Alternative Development Project Contractor	DAI-CONCADE	Especialista en Sistemas de Información Geográfica	Cochabamba	+591 (-4) -425-1655, 425-2096, 453-0354, 453-0149, 453-0278	591-717-43097	carla_siles@dai.com
58	Rosse Mary	Urquieta Barrios	Government Counterpart, Tourism	Viceministerio de Turismo, Ministerio de Desarrollo Económico, Bolivia		La Paz	591-2-237-5129, 235-2479		
59	Angel	Vaca	Tourism (Potential)	Centro Artesanal de Muebles de Bambú en Puerto Villarroel	Proprietario				
60	Jaime	Valdivia	USAID Alternative Development Project Contractor	DAI-CONCADE	Gerente, Unidad Medio Ambiente	Cochabamba	+591 (-4) -425-1655 , 425-2096, 453-0354, 453-0149,		

No.	First Name	Last Name	Stakeholder Category	Organization	JobTitle	City	Phone	Mobile Phone	Email Address
							453-0278		
61	Gonzalo	Vargas	NGO	Center for Research of Economic and Social Reality (CERES)	Jefe, Departamento de Investigación				
62	Hugo	Vargas	Government Counterpart, National Parks	Israel Guardpost, Carrasco National Park	Park Ranger	Israel			
63	Waldo	Vargas Ballester	International Development Organization	Banco Interamericano de Desarrollo (BID)	Especialista Sectorial, Medio Ambiente y Recursos Naturales	La Paz	Central:591-2-235-1221		waldov@iadb.org
64	Victor	Villegas	International Donor-Supported Natural Resources Project	Proyecto "Jatun Sach'a". AD/BOL/97/C23 (C23/FAO)	Director Nacional	Cochabamba	591-4-428-0801, -424-8124	+591-717-27041	vijor06@hotmail.com
65	Paola	Yañez Quiroga	USAID Alternative Development Project Contractor	DAI-CONCADE	Environmental Specialist	Villa Tunari	591-4-413-6513		paola_yanez@dai.com

ANNEX 7

Key Findings and Issues Identified in Stakeholder Analysis

1. Stigmatization of Chapare: The stigma associated with the Chapare (in terms of tourists' resistance to come to the region because of real or perceived problems with social conflicts) was commonly mentioned as a major impediment to developing the tourism potential of the Chapare. Although discussion of impediments to tourism is ordinarily more a matter for a feasibility assessment rather than a socioeconomic impact assessment, this particular obstacle deserves mention because it captures the socio-economic-political environment in the Chapare. As long as it persists, it will establish the primary context for tourism in the Chapare and therefore influence the nature of the impacts that tourism has on the region.

2. Alienation/distrust combined with a desire for tourism: Alienation and distrust come from various quarters in various forms within the Chapare region. Among different interest groups there was detected a strong sense of their feeling excluded from the opportunities in tourism and/or the government and NGO efforts to stimulate tourism. At the same time many of these same groups expressed a strong interest in joining in efforts to develop the tourism sector. This sense of being "left out" combined with a desire to participate in the tourism sector creates challenges but also opportunities, as captured in the following observations were made during field visits by the PEA Team:

- Municipalities feel that the private sector (hotels) have gotten all the Alternative Development resources.

- Small communities feel that the municipalities have gotten the development assistance (e.g., from PRAEDAC) for tourism, that tourism generates few direct economic benefits for the Chapare (given the way tourism is currently structured) and the few benefits that do remain in the Chapare go to hotels (i.e., a few people in the "private sector").

- Indigenous communities feel left out by everything. They do not get the alternative development assistance that (former) coca growers get and they have not received any of the alternative development assistance given to tourism in the past (which went only to hotels).

- Some residents of coca-growing areas are ill at ease with outsiders coming in. A member of the PEA Team was prevented from visiting three different potential attractions (the Mirador above Puerto Aroma, the Valle de la Luna salt outcropping, and the "Parliament of Parrots" near Shinahota) on at the advice of park rangers and other local officials concerned about the entry of an international visitor to locations on the margins of the CPA. This resistance by local residents appears to come both from their being jaded by tourism's unrealized potential in their communities (the tendency for visitors to come into their communities, bring their own food, take a few pictures, and leave trash but no economic benefits), and by cautiousness toward outsiders who might be affiliated with current efforts to eradicate coca (e.g., U.S. citizens).

Nonetheless, stakeholders saw the opportunity to make "lemonade" from "lemons", that is, create a winning outcome from currently trying circumstances. All of these social actors expressed a strong desire to see tourism developed and were eager to hear about potential new efforts to provide resources to promote it, such as the grants program being inaugurated by CHF for USAID.

3. Community-based Tourism: This concept is appropriate in principle for addressing some of the problems cited above, but it needs serious consideration in practice. Individual efforts to promote communities with fairs, cultural events, and other organized activities intended to raise the visibility of local attractions have been supported by outside donors. In the end, though, it appears that few economic benefits are distributed throughout the community. This failing is in part due to the low flow of tourists in the first place but it also stems from the lack of mechanisms to allocate benefits to the community. Taking the example of Puerto Aroma on the upper Chimoré River. This location holds the potential of being a river-based recreation destination as well as an entry point to the Carrasco National Park. However, even when and if the obstacles to the feasibility of this development can be resolved, there remains the likelihood of the unfulfilled promise of economic benefits to the Puerto Aroma community. Consequently, for the future development of tourism in the region, it is important to give practical and substantial attention to finding mechanisms for sharing economic benefits with local communities.

4. The social welfare needs of the citizens of the Chapare remain substantial: Complicating matters though is that the high-priority measures to be taken are well beyond the scope of any effort to support the tourism sector and depend on outside resources. Fortunately, some improvements supported by foreign donors and by the GOB have been underway in recent years. The good news is that if these investments continue, they not only will benefit the local population but could also raise the prospects for tourism.[8] Investments in public infrastructure (water, sanitation, and schools), in health care services, and in the delivery of other public services (solid waste collection and proper management) could generate improved quality of life for residents, reduce social conflicts, and enhance the visit experience of a larger flow of tourists.

7.3 Recommended Measures to be Taken

While the above observations are not directly related to mitigating environmental impacts of tourism developments in the Chapare, which are the primary focus of this PEA, they do present important concerns that should be taken into account when considering expanded future investments in the tourism sector. The recommendations below are not mitigations, but are issues to be considered by USAID and the wider donor community in order to anticipate possible ramifications of investments in tourism in the Chapare. The PEA Team has included a series of suggestions as to how these issues may be addressed.

1. Stigmatization: In the near term, this phenomenon is an unavoidable fact of life and not something that tourism initiatives can solve. Other major interventions of alternative development and investment have to succeed and be sustained before political conflicts have a chance of being resolved. Once an atmosphere of calm returns for a prolonged period, it will be

[8] See for example the results of the participatory workshops conducted for the development of a strategic development plan for the hotel sector in the Tropics of Cochabamba (Oficina Internacional de Trabajo, 2003).

possible to escape this stigma bit by bit. The development of natural resource attractions, such as those that might exist within the confines of the Carrasco National Park, could accelerate the resolution of this problem, as more and more tourists looking for a unique experience take a chance on the Chapare.

2. Alienation/distrust: The impact being referenced here is the inequitable distribution of the benefits of an alternative development program and its potential social-economic-political implications, which could easily be significant in a region known for its political sensibilities. It is advised that whoever makes tourism investment decisions for USAID conduct a "gainers and losers" analysis of proposed grant making. Such an analysis would explicitly identify hotel owners as obvious "winners" and other social groups/actors (especially, indigenous communities and probably small communities) as being left out. At a minimum, "being forewarned is being forearmed" is the stance that USAID and its contractors should take on the task of identifying potential winners and potential losers from the distribution of U.S. funds in the region. This gainers/losers assessment should be an integral part of the preparation of specific tourism investment packets by USAID/contractors.

3. Impact on municipalities: It is recommended that an analysis be made for each tourism investment of the burden it will impose on municipal resources. Because municipalities are the primary implementers of land use planning and are supposed to be the primary promoter and regulator of tourism under Bolivian law, USAID and its contractors should make at least a basic assessment of what impact a given tourism investment would have on its associated municipal authority. It is not necessarily the case that the ultimate USAID/contractor decision would change but the thought is that paying attention to the problem could change how some tourism investments are made. That is, simply identifying what municipality would be affected by a particular tourism investment and roughly assessing how that municipality's ability to carry out its mandates would be affected by the investment may lead to better ways to coordinate with municipalities on tourism – something that is probably sorely needed. For example, it does not appear, for example, that municipal authorities were consulted in a significant way when the decision was made to disburse money to the hotels as compensation for the blockades. If they had been, the municipalities may have proposed other ways to use the money that would have had a more sustainable benefit to the community.

4. Mechanisms for sharing economic benefits with communities: It is recommended that a genuine effort be made to facilitate community-based tourism. In general, it would be valuable to evaluate potential tourism projects for their consistency with guidance put forward by advocates of community-based tourism. An important missing ingredient to date in such efforts has been the implementation of concrete mechanisms that capture part of the economic benefits of tourism for the communities themselves. USAID's efforts could focus, for example, on technical assistance enhancing communities' ability to charge entrance fees to certain resources and/or setting up community funds that are paid into by hotel owners and/or tour operators. The community of Port Aroma, on Chimoré River and on the boundary of the Carrasco Park, has pretty good potential for receiving visitors to its river/shoreline access and to its "mirador" and the eight-meter high coca tree. But the residents do not have a way to capture much if any of the economic benefits from any visitors. Formalizing some sort of charge/entrance fee system could create a small pool of revenue that would go into a community fund. Already this particular

community has demonstrated a willingness to pay for public goods (improving the very modest road that comes to their community) with their own funds (45 Bs per lot in the community). Accordingly, a community fund could be a useful addition to their resources for “public good.” Given the findings of the PEA Team, it is advised that a part of any USAID fund destined for tourism investment be directed to pilot projects to get this kind of charge system off the ground in a few different communities. As the entity likely to implement any tourism investments at this stage, CHF would be the logical entity to make these pilot programs happen as part of its grant program.

Complementing this explicit effort to realize the sharing of economic benefits of tourism with local communities should be efforts to train and educate members of local communities on the opportunities and challenges of tourism so that they may better participate in the decision making on new tourism initiatives. Already the International Labour Organization (ILO) has undertaken training of potential workers in the hotel and tourism sector in the Chapare. This investment in human capital could be a good resource for the future and can be supplemented with communication efforts with communities to facilitate their participation in the tourism sector.

ANNEX 8

Overarching Recommendations for Tourism in the Chapare

During the implementation of this PEA, it was noted that much of the ongoing regional development activity is adversely affecting the potential for the development of a stronger regional tourism economy. For instance, river pollution is affecting the ability to develop rafting excursions in the area. Strong colonization pressure is encroaching on the region's national parks. Upper watershed damages are affecting downstream users. These are regional issues and need to be addressed using regional mechanisms.

As tourism is an element of the CONCADE program, it is incumbent on other CONCADE activities to consider their respective impacts on the tourism sector. For this reason, one of the strongest recommendations of this PEA is to seek to develop a regional environmental management organization that includes local representatives from economic and social sectors to address and highlight these issues. Under current operations, there is no mechanism to deal with these issues or to educate sector participants in the principles of environmental management.

Priority activities include the following:

- Establish a regional environmental management structure with appropriate authority

The region crosses political jurisdictions. Activities across sector lines are funded by multiple donors. While tourism is not the major contributor to the current state of the environment, it is dependent upon it. A regional approach is needed to coordinate the cumulative impacts that have developed from regional activities. If the environmental quality of the region is to support serious tourism investment, more comprehensive environmental management and monitoring are needed.

- Assist the municipalities in developing zoning and construction standards

Many of these standards are already developed. Inspections for facility construction however are minimal and variable. Because of this, the safety of clients (and regional reputation) are at risk. This activity crosses into public sector development and can easily be combined with other ongoing USAID programs in the region.

- Assist SERNAP (Servicio Nacional de Áreas Protegidas) and the indigenous communities with resource development plans

As the principal holders of natural lands in the region, SERNAP and the indigenous communities are the managers of most of the potential recreational area. These institutions must develop public use strategies with safeguards in place if tourism is to flourish. These strategies must include an enforcement component. As each trail or campground is opened, the risk of colonization will grow. Adequate institutional capacity will be needed to prevent colonists from occupying these areas.

- Develop tourism master plan, marketing and feasibility studies

There is a lot of guesswork currently predicting where investment in the tourism will provide the greatest benefit. These studies will define the reality of tourism for the area and serve to focus resources on investments with a high probability of success.

Because tourism does not operate in a vacuum, these mitigations necessarily extend to other regional activities as well. Recommendations for Integrated Support to Tourism in the Chapare are summarized as follows:

- Develop strategic approach to tourism within CONCADE grants program (Cost: $20,000).

The goal of this mitigation measure is to assure that CONCADE grants to the tourism sector provide the greatest benefit without creating disorder in the development of the sector. The level of resources dedicated to this mitigation is relatively modest because it is anticipated that the grants administrator (CHF) can draw on multiple existing tourism sector studies.

- Assist municipalities with applying zoning and construction standards and inspection procedures (Cost: $25,000).

The goal of this mitigation measure is to reinforce the fulfillment of responsibilities that are the mandate of the municipalities. Many of these standards are already developed. Inspections for facility construction however are minimal and variable. Because of this. the safety of clients (and regional reputation) are at risk. This activity crosses into public sector development and can easily be combined with other ongoing USAID programs in the region. The level of resources dedicated to this mitigation is intended to induce greater compliance through heightened awareness among regulators and the regulated community.

- Assist tour guides and municipalities adopt and apply tour safety standards and inspection procedures (Cost: $25,000).

The goal of this mitigation measure is to inform both municipalities and potential/actual tour guides and activity providers of “best safety practices.” The level of resources dedicated to this mitigation is intended to induce greater compliance through heightened awareness among regulators and the regulated community.

- Assist SERNAP and Indigenous communities with resource development plans (Cost: $20,000)

This mitigation measure is proposed as a supplement to any application of the guidance manual (cited above) to proposed grants that will affect SERNAP areas and indigenous communities. As the principal holders of natural lands in the region, SERNAP and Indigenous communities are the managers of most the potential recreational area. These institutions must develop public use strategies with safeguards in place if tourism it to flourish. These strategies must include an

enforcement component. As each trail or campground is opened, the risk of colonization will grow. Adequate institutional capacity will be needed to prevent colonist from occupying these areas.

In addition to requiring the above mitigation measures, the PEA Team recognized a need to improve environmental management region-wide for activities in the Chapare outside the purview of tourism. The region crosses political jurisdictions. Activities across sector lines and programs are funded by multiple donors. While tourism is not the major contributor to the state of the present quality of environmental, it is dependent on it. A regional approach is needed to coordinate the cumulative impacts which have developed from other regional activities. If the environmental quality of the region is to support serious tourism investment, more comprehensive environmental management and monitoring are needed. Based on these observations, it is suggested that USAID support efforts to establish a regional environmental management structure with appropriate authority.

ANNEX 9

CITES Appendix I Species Possible in the CPA

Class	Order	Family	Genus-species-Citation-subspecies
Mammalia	Primates	Callitrichidae	Callimico goeldii (Thomas, 1904)
Mammalia	Xenarthra	Dasypodidae	Priodontes maximus (Kerr, 1792)
Mammalia	Carnivora	Ursidae	Tremarctos ornatus (F. G. Cuvier, 1825)
Mammalia	Carnivora	Mustelidae	Lontra longicaudis (Olfers, 1818)
Mammalia	Carnivora	Felidae	Leopardus (Felis) pardalis (Linnaeus, 1758)
Mammalia	Carnivora	Felidae	Leopardus (Felis) wiedii (Schinz, 1821)
Mammalia	Artiodactyla	Tayassuidae	Catagonus wagneri (Rusconi, 1930)
Mammalia	Artiodactyla	Cervidae	Blastocerus dichotomus (Illiger, 1815)
Mammalia	Artiodactyla	Cervidae	Ozotoceros bezoarticus (Linnaeus, 1758)
Aves	Ciconiiformes	Ciconiidae	Jabiru mycteria (Lichtenstein, 1819)
Aves	Falconiformes	Accipitridae	Harpia harpyja (Linnaeus, 1758)
Aves	Falconiformes	Falconidae	Falco peregrinus Tunstall, 1771
Aves	Charadriiformes	Scolopacidae	Numenius borealis (Forster, 1772)
Aves	Psittaciformes	Psittacidae	Amazona tucumana (Cabanis, 1885)
Aves	Psittaciformes	Psittacidae	Ara macao (Linnaeus, 1758)
Aves	Psittaciformes	Psittacidae	Ara militaris (Linnaeus, 1766)
Reptilia	Crocodylia	Alligatoridae	Caiman latirostris CITES Appendix I populations
Reptilia	Crocodylia	Alligatoridae	Melanosuchus niger CITES Appendix I populations
Reptilia	Serpentes	Boidae	Boa constrictor Linnaeus, 1758
Reptilia	Serpentes	Boidae	Boa constrictor Philippi, 1873 ssp. occidentalis
Cactaceae	Discocactus	Boliviensis	Buining et al.
Cactaceae	Discocactus	Ferricola	Buining & Brederoo
Cactaceae	Discocactus	Heptacanthus	(Rodrigues) Britton & Rose

Class	Order	Family	Genus-species-Citation-subspecies
Cactaceae	Discocactus	Heptacanthus	(Rodrigues) Britton & Rose
Orchidaceae	Phragmipedium	Caricinum	(Lindl. & Paxton) Rolfe
Podocarpaceae	Podocarpus	Parlatorei	Pilg. In Engler

IUCN RED LIST ENDANGERED SPECIES POSSIBLE IN THE CPA

Class	Order	Family	Scientific Name	Common Name
Aves	Psittaciformes	Psittacidae	*Anodorhynchus hyacinthinus*	Hyacinth Macaw
Aves	Psittaciformes	Psittacidae	*Ara rubrogenys*	Red-Fronted Macaw
Aves	Passeriformes	Furnariidae	*Cranioleuca henricae*	Bolivian Spinetail
Aves	Passeriformes	Emberizidae	*Poospiza garleppi*	Cochabamba Mountain-Finch
Aves	Passeriformes	Formicariidae	*Terenura sharpei*	Yellow-Rumped Antwren
Mammalia	Marsupialia	Didelphidae	*Monodelphis kunsi*	Pygmy Short-Tailed Opossum
Mammalia	Xenarthra	Dasypodidae		
Mammalia	Xenarthra	Dasypodidae	*Priodontes maximus*	Giant Armadillo
Mammalia	Artiodactyla	Tayassuidae	*Catagonus wagneri*	Chacoan Peccary
Mammalia	Rodentia	Dinomyidae	*Dinomys branickii*	Pacarana
Mammalia	Carnivora	Felidae	*Oreailurus jacobita*	Andean Cat

ANNEX 10

Demographics and Local Political and Social Structure in the Chapare

A. Settlers

In 1964, USAID granted more than US$33 million in loans for the construction of the asphalt highway between Cochabamba and the Chapare region, and, later, another US$18 million for the construction of an unpaved secondary road north of Villa Tunari, covering an additional 22 kilometers. Subsequently, the Government implemented the "Bohan Plan" to settle the lowlands. That displaced indigenous Andean Quechuas and Aymaras to enclaves known as "Colonias" on the eastern plains. Unfamiliarity with the territory, problems in adapting to the tropical climate, a lack of markets for their products, and the scarcity of technical and financial assistance, made them simple self-subsistence producers and coca leaf growers (Albó, 1990).

Although the cultivation and traditional use of the coca leaf predates the Incas, the "colonias" witnessed a significant increase; the coca leaf being used in the difficult mining and fieldwork. Andean settlers brought by the Government to the warm valleys of the east started producing large amounts of coca leaf. In the 1980s, the coca and cocaine business had created a true parallel economy that generated more foreign currency than legal exports and kept the country afloat during its worst crisis (Albó, 1990).

The boom in coca growing produced a field-to-field migration from the Andean areas to tropical Cochabamba and La Paz. The crisis in the peasant world found an economic palliative in the cultivation of the coca leaf since the selling of the leaf generated, for the settling peasants, an income equivalent to what they would have received for a profitable agricultural product. This crop generated a fabulous business for the foreign and domestic cocaine traffickers. The peasant movement of coca leaf growers that grew up around the settlement areas has been one of the most troublesome sectors in recent decades with respect to its resistance to international demands for the eradication of coca leaf production. There has been a clear need for a coca plantation replacement strategy.

Economic status

The settlers of the Chapare region have a type of subsistence economy based on itinerant farming, with a system of crops intended primarily for personal consumption, and with little market orientation. Slash and burn farming of the primary forest is used mainly for rice, yucca, corn, and banana, which are rotated seasonally in a 4 to 5 year cycle until the soil is exhausted. After this brief period, the settlers abandon the land. Pastures cultivated on stripped land support cattle bred for milk and meat; poultry, pigs, and rabbits are also raised.

B. Indigenous Peoples

In the east, the indigenous peoples of the pre-Colombian era inhabited the forests, grasslands, and warm valleys of the lowlands in the territory that is now Bolivia. They were very diverse, both ethnically and culturally. Prior to the Hispanic era, there were approximately 1.2 million indigenous people in these Moxos grasslands (Denevan, 1976). Many of the Yuricaré and Yuqui

communities are currently settled on artificial hills and pre-Columbian hydraulic systems by means of which they managed the floods in the low-lying parts of their vast territories' river basins.

Bolivia's indigenous society was historically structured on kinship; economic and social activities were organized around taking maximum advantage of the diversity of resources in the forests and on the grasslands of low-lying areas, or in the high mountains and Andean valleys. These economic and social relationships were based on fundamental principles of equitable distribution of the "reciprocal economy." This economic system enabled them to sustain daily life and reproduce the society for consecutive generations, all the way to the present. In general, the ethnic groups of the east were made up of very local societies with a simple organization. According to some anthropologists, they did not have a state, not because they had failed to develop to that point, but because they had become immune to it and had gone beyond it through control of authority, avoiding the division of labor and the establishment of a priestly caste (Albó 1990).

In the past 20 years, the indigenous peoples of the east mobilized in pursuit of a territory in which they could live and develop; this process occurred after many years of being marginalized while their vital spaces were invaded. In 1997, the Instituto Nacional de Reforma Agraria (INRA) Law recognized the indigenous peoples' right to own Native Territorios Comunitarios de Origen (TCO, Spanish acronym). Title to the TCO of the Yuricaré People has now been properly cleared and turned over. The land also has dual status as a National Park (Indigenous Territory of the Isiboro Sécure National Park; TIPNIS, Spanish acronym); title to the Yuqui TCO was provisionally turned over by Supreme Decree.

Economic status

Economic life in the Amazonian indigenous world was and is organized around a series of kinship networks, which link basic units of production and consumption, composed of married couples and dependent family members sharing a hearth, as a symbol of the domestic group. These kinship networks jointly cultivate small farms, hunt, fish, and gather forest products to satisfy their subsistence needs. The basic economic unit of indigenous society is the "local settlement," which consists of a group of domestic units or hearths in very close interdependency, marked by relationships of cultural identity and kinship with shared language, knowledge, customs, ethical values, and religion.

Among the subsistence activities, indigenous agriculture may be considered a stable system of forest management, imitating the forest's heterogeneousness and stratification. After a small portion of forest is felled, food species such as yucca or cassava, various types of plantains, corn, peanuts, vegetables, and fruit are cultivated for two or three years, and then the land is allowed to lie fallow for 10 to 20 years, enough time to permit the secondary forest to regenerate naturally to maturity.

The gathering of forest and grassland products is very important for the indigenous community's subsistence. Hundreds of food products from the forest have been counted, including an array of seeds, fruits, nuts, honeys, tubers, mushrooms, insects, resins, barks, wood, lianas, bamboo,

medicinal plants, and so forth. This subsystem provides important material resources for building homes and making tools for work, hunting, fishing, and ritual and cultural use.

Another subsistence activity is hunting which, in addition to contributing protein-food value, conveys the symbolic value of social prestige to the hunters, since hunting is an activity practiced exclusively by men. Some studies indicate that the productivity of hunting as a function of the aforementioned variables is between 110 and 3,200 grams of meat per hour invested in hunting, depending on the site (COICA, 1995).

Fishing is an important activity in indigenous subsistence, since it is the most accessible and productive source of protein. According to Stocks in COICA (1995), for every hour spent on hunting, they devote six hours to fishing, and every hour of fishing produces six times more flesh than is produced in an hour of hunting. Scientific studies have identified more than 1,000 species of fish in all the rivers of the Amazon basin, many of which migrate thousands of kilometers to spawn in the tributaries of the elevated parts of the river basin. Indigenous knowledge in this area is vast and profound with respect to the cycles of life and feeding habits of aquatic species, to which they adapt the fishing technology.

The activities of the domestic unit with respect to the manufacture of tools, utensils, and clothing, and the construction of homes and furnishings, were practiced by almost all the indigenous peoples of the lowlands. Knowledge of manufacturing techniques and materials was developed by each indigenous community in accordance with the locally available materials and the skills that were passed down from fathers to sons and mothers to daughters in accordance with the gender assignment of each activity (COICA, 1995).

The exchange of goods and services, in the indigenous communities of both the lowlands and the Andes, at the outset, before the use of money, was based on the model of the “reciprocal economy” or deferred exchange of goods among different ethnic groups. This gift economy arose as a result of the society’s cultural values, which inculcated in its members, from a young age, the obligation to share any material good, in a circumstance that implied that each good or service received generated a new relationship, like a debt, that required one to give something in reciprocity.

The moral order in the management of the indigenous peoples’ economic relationships is generally based on the obligation of every member of the society to engage in reciprocal relationships; generosity is the central value of the system and is repaid with increased prestige and social status. As it rewards generosity, the society condemns any form of selfish accumulation of goods of any type by exclusion from social life through scorn or gossip, which is equivalent to social death (COICA 1995).

The Native Communal Lands (TCO, Spanish acronym) guarantee the property rights of the indigenous peoples and communities to their territories, taking into consideration their economic, social, and cultural implications, as well as the sustainable use and exploitation of renewable natural resources. This system of communal land ownership did not provide for reversion, transfer, attachment, or adverse possession. The distribution and redistribution of land for

individual and family use and exploitation within each TCO will be governed by community rules in accordance with their own norms and customs. (INRA Law, 1996)

The use of communally owned land for purposes of family well being or the economic development of indigenous communities and peoples, in accordance with criteria of ability to make the best use of the land, is defined as economic-social function for communities and TCOs. This is understood as the sustainable use of the land for forest agriculture and other productive activities, as well as for conservation and protection of biodiversity, research and ecotourism, for the benefit of society and in the collective interest. The TCOs and community lands are exempt from taxes on agrarian real estate (INRA Law, 1996).

C. Local Political and Social Structure

Organizational and institutional characteristics of the Chapare are represented by civil society institutions and organizations that support economic and social development, governmental agencies that fall under the framework of administrative decentralization in the country, international cooperative organizations, and private non-profit institutions. Civil society organizations are represented by:

- The Special Federation of Rural Workers of Cochabamba
- The Special Federation of Colonists of the Carrasco Tropics
- The Special Federation of Colonists of Chimoré
- The Sole Federation of United Centers
- The Special Federation of Traditional Zones of the Chapare
- The Special Federation of the Chapare Tropics
- The Federation of Rural Workers of the Tiraque Tropics

At the community level, the organizational unit is the Agrarian Labor Union, which unites the members of a denominated colony. The supra-community organization is represented by the central labor unions, which is further articulated in federations. There are 85 centers and 892 labor unions to which are affiliated 41,694 rural workers. There are 77 Farming and Livestock Producers Associations in the Cochabamba Tropics, 50 Water Administration Committees, and Base Territory Organizations.

Indigenous groups are organized in municipal indigenous districts at the community level and are further articulated at a higher organizational level in the indigenous peoples' centers. In our case, the Yuricaré indigenous groups belong to the Beni Indigenous Group Center (CPIB) and the Yuqui indigenous group to the Cochabamba Tropics Indigenous Group Center (CPITCO).

The public institutions or national governmental institutions that function under the protection of Law 1008 and the financing of the Vice Ministry of Alternative Development fall under the Ministry of Agriculture and Rural Development. The counternarcotics strategy also involves the Ministries of Foreign Affairs, Government, Finance, National Defense, Health and Social Prevention. The Directorate for Agricultural Conversion is responsible for the farming and livestock units and the issuance of licenses. The National Alternative Development Fund (FNDA), along with the National Regional Development Fund (FNDR, Spanish acronym)), the Social Investment Fund (FIS, Spanish acronym), and the Farmer Development Fund (FDC,

Spanish acronym), is responsible for financing alternative development plans, programs, and projects.

On the other hand, there are national public institutions that interact with regional programs, such as: the Ministry of Education, the Ministry of Health, Administration of Justice and Human Rights, Forestry Control and Environmental Protection (Forestry Superintendence, Ecological Policy, Municipal Forestry Units, Protected Areas, and decentralized institutions, such as Yacimientos Petrolíferos Bolivianos, National Electricity Company, Empresa de Luz y Fuerza, Departmental Road Service, National Telecommunications Company; Service for the Improvement of Navigation, among others.

The Departmental Prefecture, under the framework of decentralized administration governed by Law 1654 and Law 1551, is responsible for the formulation of the Departmental Plans for Economic and Social Development of Cochabamba, the channeling of requirements and relationships with the Municipal Governments within the framework of its jurisdiction. The Prefecture implements the “Development Plan for the Cochabamba Tropics,” the “Support Program for the Indigenous Communities of the Cochabamba Tropics,” and citizen protection and the armed forces.

The municipal governments, in accordance with the Popular Participation Law, which grants greater participation to the municipality (until this point was an insignificant administrative unit), assigns financial resources as a function of the population in each territorial jurisdiction, fostering mechanisms for citizen participation in conformation with the Vigilance Committees (social control) and decision-making through the processes of municipal participatory planning. At the same time, the possibility is established to constitute associations or municipal associations as a function of common interests and shared vocations. In the case of the Chapare, the “Municipal Association of the Cochabamba Tropics” has been formed.

Municipal responsibilities include providing infrastructure and equipment for education, health, basic sanitation, culture and sport services; administering the urban and rural cadastres; promoting rural development through the construction of local roads and small-scale irrigation; promoting popular participation and gender equality and conserving and restoring the cultural, historical and environmental patrimony, among others.

ANNEX 11

Environmental Review of the Chapare Tropical Resort

EXECUTIVE SUMMARY

The present case study is an environmental evaluation of the Chapare Tropical Resort (CTR) located near Villa Tunari in the Tropics of Cochabamba. The CTR is planned as a 118 room resort facility featuring a golf course and recreational facilities including tennis courts and a swimming pool. The hotel is commercialized as a time share property and is foreseen to be operated as an all-inclusive resort.

Construction of the CTR started in the mid 1990s but building activities were halted and reinitiated several times. As of February 2004 two building blocks and the central lobby area that connects both buildings have been completed in rough construction. The buildings are bare of any installations but sanitary piping and electrical conduits in the western wing.

The CTR is located just south of the confluence of the Rivers San Mateo y Espíritu Santo. Although sited on a sandstone formation about 15 m above the river bed, the San Mateo River continues to cut away through the sand stone bank and some terrain of the hotel has been washed away by the river.

The owners of CTR have never processed the environmental license for the project as required by law. Therefore, as a first step, the evaluation recommends that the CTR prior to continuing construction should obtain the environmental license for the entire hotel project to ensure compliance with Bolivian environmental law. This will guarantee potential investors and timeshare holders that the property has fulfilled the environmental legal requirements.

The inspection of the visible construction in absence of any plans or information on the project did not allow for any understanding of the type of installations and equipment foreseen to serve the hotel's air conditioning, illumination, fresh water and hot water requirements. Neither was there any indication regarding the planned treatment for the solid and liquid waste that will be generated by the hotel's operation.

As there exists no municipal sewerage or waste collection service, nor any freshwater supply that the CTR could connect to or benefit from, the hotel will have to solve these operational requirements on its own and partly on property. The CTR planners have identified a fresh water source; however water extraction from this source requires approval by the responsible authorities. Once the source has been approved based on hydrological studies to be submitted by the hotel, the CTR will have to decide to which degree it will treat the freshwater to insure that health and safety standards for its use in the hotel's operation are met.

For the residual water being generated the CTR will have to choose a waste water treatment option. Current construction shows separate plumbing for gray and black wastewater. However, both wastewater types need adequate treatment before being either reused for e.g. irrigation (as in the case gray water) or being discharged into the environment (as in the case of the treated black water).

Although, the energy requirements of the CTR can be supplied by the national electricity grid, the hotel should consider the installation of energy efficient equipment and the use of

cogeneration and renewable energy where possible in order to reduce environmental impacts and operating cost.

In the absence of a municipal waste collection service and with no adequate disposal site in the area, the solid waste generated by the hotel's operation will have to be managed on site. The hotel should consider the implementation of a waste management program addressing concepts such as waste reduction, separation of recyclables and hazardous materials as well as the composting of organic waste.

In order to minimize environmental impacts once the hotel is in operation, the case study recommends that the CTR implements Best Practices in its freshwater, energy, wastewater as well as solid and hazardous waste management.

An Environmental Management System provides an efficient and systematic approach to implement Best Practices throughout the operation of a hotel facility. In addition it allows owners and operators to profit from the benefits achieved through improved environmental performance and a reduction in operating cost.

1. Introduction

This study is an environmental compliance review of the Chapare Tropical Resort (CTR) located in the vicinity of Villa Tunari in the tropics of Cochabamba. This review was commissioned by the U.S Agency for International Development (USAID) to assist the CTR developers in their efforts to comply with Bolivian environmental law, to provide an environmental evaluation of the facility and make some recommendations for the environmentally conscious operation of the hotel. Consequently this document is intended to guide the development of future facilities and operations associated with the CTR and assist the owners with developing an environmentally sensitive development approach.

The operational concept of the CTR is designed to provide a vacation and golf resort facility for guests and timeshare owners. The hotel will be operated as an all-inclusive resort where guests can spend their entire time on the premises without the need to visit other regional attractions to supplement their vacation experience. Within the all-inclusive package guests will have access to all facilities, such as restaurants, a spa, a golf center and club, tennis courts, swimming pool and other recreational activities at no or only minimal additional cost.[9]

2. Background and Supporting Documentation

According to the information provided, construction of the CTR started in the 1990s. The site chosen for the CTR lies at the confluence of the Río Espíritu Santo and the Río San Mateo. Once joined, these rivers form the Río Chapare which then continues on its course ultimately toward the Amazon. Construction continued intermittently until 2000 when building activities ceased due to financial difficulties experienced by the then owners. In 2000, USAID provided emergency funding to the owners to meet financial requirements of creditors and in 2001 to enable the developers to conduct a study of financial feasibility. The investment group reformed in 2002 and the internationally active Spanish hotel and tour operator Barceló agreed to list and operate the property under its system of hotels and timeshares for marketing and management purposes. For the present, construction has ceased, presumably because of the loss of the bridge at Río Chapare.

After a history of limited participation in the CTR financing, USAID has agreed to provide one last assistance activity in the form of this environmental review. As a result of the findings of the Supplemental CONCADE Programmatic Environmental Assessment (PEA) for Tourism Activities in the Tropics of Cochabamba, USAID will no longer support the addition of room space to the region relying instead on market forces to drive such investments. In accordance with the PEA, future aid activities will focus on assistance to existing operations and in the development of regional tourism attractions.

3. Summary of Activities

The team of consultants visited the CTR on February 17, 19 and 28, 2004. While the first visit served for orientation only, the two additional visits were used for an extensive inspection of the construction site and its surroundings. In the meantime between visits to the site, the consultants

[9] The CTR has sold an unknown number of time-share weeks for an average price of US$3,500 to US$3,800 for one week per year over a 20-year period. To integrate the CTR into an established net of timeshare properties the owners/partners formed an alliance with Interval travel, a U.S.-based timeshare property operator. The all-inclusive package is planned to be priced at US$45 to US$50 per person per night. The walk-in rate was calculated at US$70 to US$80.

researched information on the CTR in Cochabamba by locating the sales office of the company. Currently the CTR is marketed by Chapare Suites S.A. with offices in the Continental Building on Calle Pedro Blanco corner with Calle Santa Cruz, Cochabamba.

In a telephone conversation on February 26, 2004, the current sales manager, Alejandro Bakir, offered to arrange a meeting with engineer Carlos Hinojosa who had overseen earlier construction activities. According to Mr. Bakir, Carlos Hinojosa had in-depth knowledge on the construction and planning details of the CTR. A team member met with engineer Hinojosa on March 4, 2004 to clarify construction details and verify any plans regarding management initiatives for the operation of the hotel.

At the same time the team tried to obtain documentation from the offices of Development Alternatives Inc. (DAI). DAI had, according to the terms of reference for this review, prepared an environmental review of the CTR and assisted the project in initiating processing of the environmental license required by Bolivian law. DAI provided the team with a copy of the document named Notification of Procedure (Notificación de Procedimiento, NP) that assesses the requirements for compliance with Bolivian environmental legislation. The team was informed by DAI that the environmental review was never actually conducted. DAI explained that the process was halted, even though proposals to do the review were submitted by two international firms. It was for this reason that the team conducted the present environmental review.

4. Applicable Laws and Regulations

Bolivia's Public Law 1333[10] establishes the country's environmental and natural resources protection framework. The law regulates the impact of human activities on the environment and promotes the sustainable development of activities designed to improve the population's quality of life.

Law 1333 requires all public and private projects involving activities with the potential to cause negative impacts to undergo an environmental review and to develop mitigation measures to minimize these impacts. The law states that no public or private project involving these potentially impacting activities can be carried out without an environmental license. The environmental license is issued by the authorities when approving the environmental review and mitigation measures. The environmental review process is structured into two different procedures.

The difference in procedures is caused by the fact that Bolivian Law 1333 came into effect on April 27, 1992, while the regulation of the environmental law that defines the technical and judicial details of the same did not come into effect until December 8, 1995.

Projects or activities that were initiated prior to 1996 fall under the System of Control of Environmental Quality (Sistema de Control de Calidad Ambiental, CCA). The CCA requires the elaboration of an Environmental Manifest (Manifesto Ambiental, MA). The manifest identifies the impacts and classifies them according to the environmental norms included in the regulation. The MA points out the parameters of the project or activity that are within or outside the norms.

[10] Ley de Medio Ambiente dated April 27, 1992.

Depending on the impacts identified and the parameters outside the norms, the company has to develop a Plan of Environmental Adjustment (Plan de Adecuación Ambiental, PAA). The PAA outlines how the company will get the parameters that are outside any norms within the same. The authorities allow for a period of five years for achieving and fulfilling the PAA.

The Environmental Manifest and the PAA, if required, will be revised by the relevant authority. If accepted and approved, the authority issues the Declaration of Environmental Adjustment (Declaratoria de Adecuación Ambiental, DAA) to the company. The DAA is the environmental license for any project or activity initiated prior to 1996 and represents the legal document confirming compliance with the stipulations of the environmental law.

An EIA (Evaluación de Impacto Ambiental, EIA) is required for projects, facilities or activities, public or private, initiated in 1996 or thereafter. Under this procedure the law requires that prior to the initiation of construction and operation the owner elaborates an Environmental Fact Sheet (Ficha Ambiental, FA). The FA, prepared during the pre-feasibility stage of the project, has to identify the foreseen extent of the environmental impacts caused by the planned activity.

Based on the information provided in the Environmental Fact Sheet the authorities classify the project according to the degree of environmental review required. There are four categories:

- A project where a full study of the EIA of the action is required;
- A project where a specific study of the EIA of sub-activity(s) is required;
- A project where a conceptual environmental review is required;
- A project where no environmental review is necessary.

If classified into category 1 or 2, the project will, if the EIA is approved by the appropriate environmental authority, be issued a Declaration of Environmental Impact (Declaratoria de Impactos Ambientales, DIA). Again, the DIA is the environmental license confirming legal compliance.

All work and studies under the EIA have to be carried out by authorized and approved consultants.

One of the noticeable differences between both procedures is that the System of Control of Environmental Quality (CCA) with the Environmental Manifest and the Plan of Environmental Adjustments (PAA) are intended to guide an activity in operation within the parameters of the existing norms. In contrast the Evaluation of Environmental Impact (EIA) with the Environmental Fact Sheet and the following process of classification and possible Evaluation of Environmental Impacts (EIA) intend to mitigate possible environmental impacts prior to project implementation.

DAI's Notification of Procedure (Notificación de Procedimiento)
In early summer 2002 the CTR representatives approached DAI for assistance to clarify the legal requirements the hotel needed to comply with under Bolivian legislation. In an internal

document[11] DAI explained that the CTR would have to elaborate and present an Environmental Manifest (MA). Said manifest would have to include:

- A description of activities required to complete the project,
- Soil studies,
- A study of the hydrological capacity of the Capriles creek watershed, potential source of fresh water for the CTR, and
- An environmental redesign for the implementation and operation of the:
  - System to draw and distribute fresh water
  - System to manage and dispose solid and liquid waste (waste and graywater and solid waste).

In addition the memo states the need to elaborate an Environmental Impact Study (Estudio Impacto Ambiental) by a qualified foreign company and the respective application for the Dictamen Ambiental.

Regarding the need to prepare and present the Environmental Manifest, the memo makes reference to Title 5, Chapter 2, Articles 100 and 101 of the Environmental Law 1333. This reference is not correct as said articles in the law refer to violations of the law and the applicable sanctions. The articles referenced are to be found in the regulations to the law (Reglamento a la Ley de Medio Ambiente).

Interpreting articles 100 and 101, the DAI memo recommends that the CTR has to prepare an Environmental Manifest that initiates the process to obtain the Environmental License required for the project. But said articles state that projects, works (construction) and activities in implementation, operation or abandoned at the time when the regulation came into force need to initiate the process under the System of Control of Environmental Quality (CCA).[12]

It is interesting to note that the regulation came into effect on December 8, 1995. According to information provided to the consultants, construction of the CTR did not start until 1996. Therefore it needs to be clarified if the CTR has to follow the CCA procedure requiring an Environmental Manifest and the possible Plan for Environmental Adjustment (PAA) to obtain the environmental license (DAA) or if the hotel has to follow the EIA and prepare an Environmental Fact Sheet to establish the type Environmental Impact Study that needs to be undertaken in order to obtain a DIA.

According to information available for this review the CTR would fall under the EIA procedure. Although the chronological details of the CTR project will help to clarify what procedure needs to be followed,[13] the consultants feel that in any case the EIA should be applied based on the following reasons:

- Any impact caused by the clearing of and the construction of the CTR is not reversible without questioning the entire project.

[11] Notificación de Procedimiento (NP-208-01-02) dated June 17, 2002, prepared by Ekaterina Pivinskaya, DAI-CONCADE.
[12] This is a free translation of the original text of Art. 100.
[13] It is not known to the consultants if any pre-construction activities of the CTR lead to classifying the project for the CCA procedure.

- Actual impacts caused by the site clearing might be limited (see chapter 5).
- The most important environmental impacts will be caused by the operation and maintenance of the hotel.
- The CTR has never been operational and hence had no opportunity to cause operational impacts on the environment. But it would be these (so far non-existing) impacts the CCA procedure would have to guide and keep within the applicable and existing norms.
- The EIA on the other hand will help to mitigate and reduce any possible environmental impacts that will be created when finalizing construction and starting operation of the CTR.

5. Physical Setting

The Chapare Tropical Resort is located along the southern banks of the Río San Mateo approximately 15 m above the riverbed just upstream from the confluence of the Río San Mateo and the Río Espíritu Santo. The upper geological strata are composed of ancient river sediments, which make up between 2-3 m of the subsurface of the CTR area. Underlying that formation is a sandstone stratum that forms the majority of the river bank for the San Mateo. While resistant to river forces, the river basin has formed from the erosion of this formation and the river continues to cut its way through the sandstone bank.

Figure 1 shows the sandstone formation upon which the CTR rests from the opposite river bank of the Río San Mateo.

Figure 1: View of the CTR site from Río San Mateo (opposite river bank)

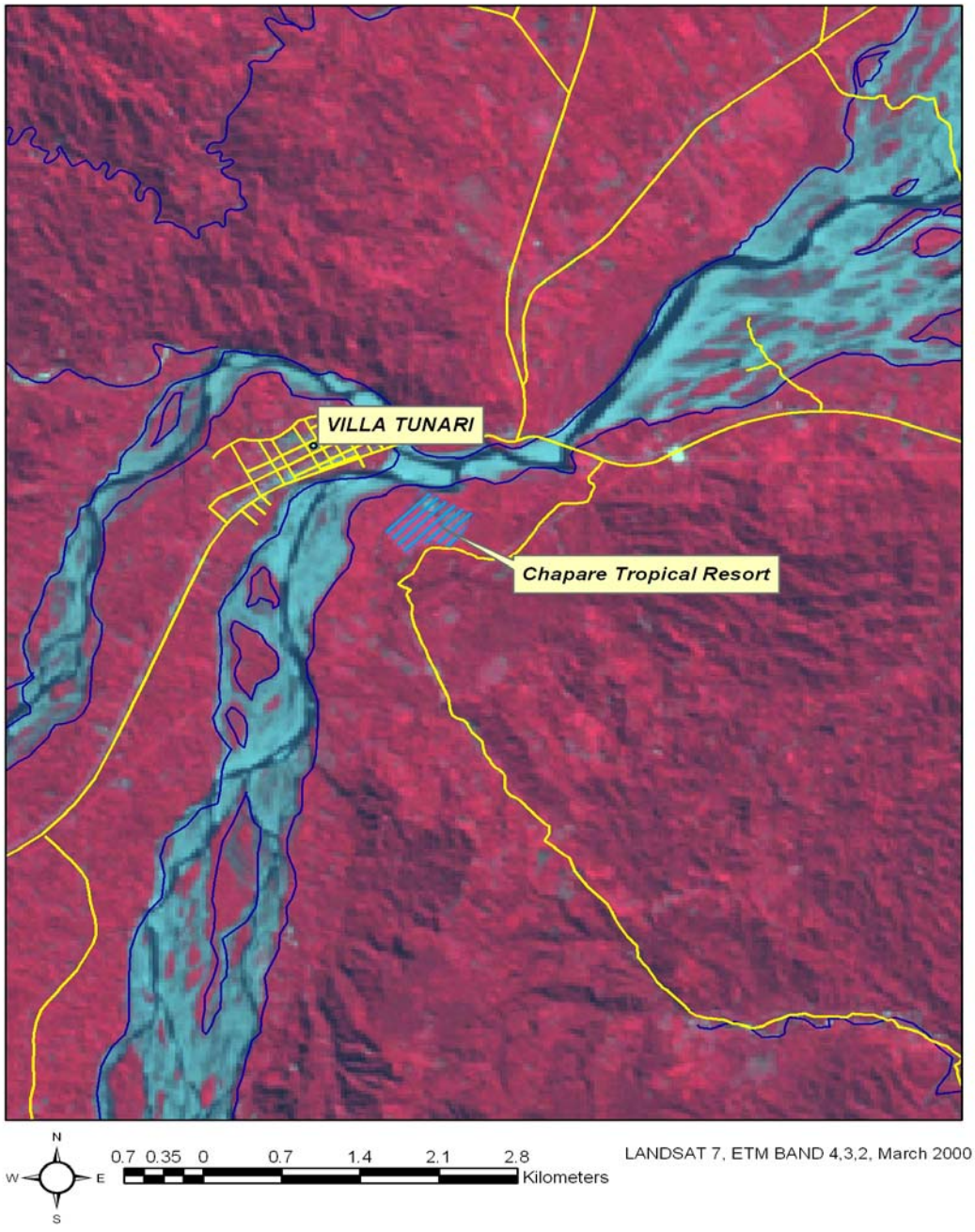
The San Mateo, forming the northern boundary of the CTR property, is composed of a meandering riverbed bordered by sandstone cliffs. As shown in Figure 2 on the following page, the river gorge ranges from 500 m to 1 km in width and the river follows its changing course as flows dictate. Composition of the riverbed that is made up of sands, gravels, cobbles and boulders indicates extreme fluctuations in river flow levels. The rainy season, from November to March, produces the highest flows, which can increase the actual channel utilization from a low flow condition of 50 or so meters to over a kilometer in width.

In the vicinity of the CTR, the surrounding vegetative component is disturbed and has been the subject of various human activities. The national high voltage power line grid passes close to the resort and hence electric power seems to be easily accessible. The right-of-way has been cleared of trees to create an area of bush and grasses for maintenance purposes. Useful timber had been removed from adjacent properties and evidence was found indicating that neighboring properties were at one time used to cultivate banana or other crops. A cobblestone road, constructed under a USAID program entitled Caminos Vecinales, passes in front of the CTR's entrance.

The CTR site consists of a large grass area dotted with palm trees that have grown to a height of approximately 10 m. Banana trees line the margins of the property. Traveling south on the access road leads to several small villages, the most developed of which is Agrigento some 1.5 km below the CTR. Land use varies from cattle and yucca to banana production in small, family scale operations.

Settlement has been continuous from at least 1969 when the local school was constructed. The village has a freshwater distribution system consisting of a concrete tank of approximately 1,000 gallons that is supplied from a gravity fed system and distributed, by gravity to the inhabitants of the area. A simple chlorine treatment system is employed to maintain water quality. The system is composed of a tank of liquid chlorine passing through a gravity fed drip into the water pipe.

Figure 2
Location of Chapare Tropical Resort



6. Description of the Chapare Tropical Resort

6.1 The site of the Chapare Tropical Resort

The Chapare Tropical Resort's property is partly located within the current flow direction of the San Mateo River. Due to changes in the river bed and the flow of the river, the property has lost some area ("beach") that has been washed away.

View toward San Mateo River

The team studied maximum highs of the Río San Mateo water levels over the last 40 years. The study supposedly states that the water level never reached the town of Villa Tunari. With the CTR being located on the same elevation as Villa Tunari, the study assumes that the resort is outside the rivers' flood zone.

Nevertheless the changes in the flow pattern of the two rivers enclosing Villa Tunari and passing in front of the hotel have been of concern to local authorities and residents. In Villa Tunari some properties, such as the Hotel Las Palmas, the Restaurant San Silvestre, and the former Hotel Sumuque, have lost ground to the river.

In this context, PROMIC (Programa de Manejo de Cuencas), a program that studies the management of watersheds, is said to have undertaken an analysis on how the river flow affects human settlements in the Villa Tunari area and what measures need to be taken to contain

possible impacts. The recommendations seem to foresee the installation of *gabions*[14] along both riverbeds to guide and redirect the rivers in order to protect Villa Tunari and the CTR.

To reach the CTR the traveler would use the principal road connecting Cochabamba with Santa Cruz. This road enters the Chapare just before reaching Villa Tunari and continues onward over the Chapare Bridge to Chimoré and Santa Cruz. It is the main access road for visitors coming to the Chapare from either side of the valley. Coming from the direction of Cochabamba the traveler has to cross the Río Chapare, turn right after the bridge and continue about two kilometers on a road built under the *Caminos Vecinales* program until reaching the entrance to the CTR property.

Unfortunately, the Chapare Bridge located about 700 m downstream from the CTR has been washed out by Chapare River just before Christmas 2003. Therefore, anyone planning to reach the CTR from the Villa Tunari side has to cross the river on boat or a pontoon if traveling by vehicle. A contract has been let to reconstruct the bridge and completion is anticipated by the end of October 2004.

6.2 Current status of Construction

The initial construction of the CTR started in 1996. Due to reasons not known to the team, construction has been halted and reinitiated several times. On one occasion, financing from the project bank (Banco BISA) may have been interrupted after a blockade in the area which lasted from September to October 2000.

Financial difficulties seemed to have continued throughout 2003, until the fall of that year when the project found new investors and business associates. It then began a phase of recapitalization. In November 2003 the new owners organized a re-launch of construction activities that was featured on television and in newspapers. However, construction activities were again halted after the fall of the bridge over the Chapare River.

[14] A gabion is a protection wall made of river stones held together by a mesh of rust free wire.

View of East wing from pool area

East wing (as seen from roof of West wing)

When the consultants visited the construction site there was no activity. A construction worker who serves as guard on the property confirmed that all workers had left. Most recent work on the site focused on furbishing two rooms or suites (as they are referred to) with tiles and windows to prepare them as show rooms.

As of February 2004 construction consisted of the two building blocks or wings that are connected by the entrance or future lobby area. Each block or wing consists of 3 levels or floors

(ground, first and second) with approximately 10 rooms on each level facing the pool to one side and the future golf course to the other side. The CTR is planned to have a total of 118 rooms and suites.

View from western block to eastern block

The pool is located between the building blocks and the drop off to the river.

Pool view from lobby roof with San Mateo River in the background

The east wing is still in a condition of rough construction featuring unfinished walls. No flooring or any installations but drain tubes for rain water. Rain water is drained from the roof with PVC pipes that run along the inner corner of the balconies to the ground floor.

East wing balconies with separate rain water drainage

Installations in the west wing include sanitary pipes and ducts for electrical installations. However, there are no windows or balcony doors, nor bathroom installations or floor tiling. Only exemptions are the two showrooms equipped with floor tiles and balcony sliding glass doors, but no bathroom installations. The installations for sanitary drainage pipes seem to indicate the separation of graywater from the hand wash basins and the shower or bath tubs and wastewater from the toilets.

Indication of separate drain pipes for graywater and wastewater (West wing)

The building has been exposed to the forces of climate over several years. The thatch roof structure (*jatata*) above the future lobby area shows first signs of deterioration.

Deteriorated thatch roof of future lobby

6.3 Supporting Infrastructure

6.3.1 Water Supply

To date the construction site has been supplied with ground water from a small source in front of the east wing of the building. This spring has also served for the sanitary needs of the construction crew.

Current water supply line to the construction site

According to the caretaker the actual water supply for the hotel has not been installed yet.

6.3.2 Wastewater Treatment

Sanitary installations in the west wing seem to indicate the separation of graywater and wastewater. However, there was no information on the type of wastewater water treatment that the CTR will use. From the site inspection and without any additional information or drawings of the construction, it could not be determined where the wastewater that will be generated by the CTR will be collected and discharged.

6.3.3 Energy supply

The site visits did not reveal any installations for the electricity supply to the hotel or electricity management on the property. No further information regarding the energy supply to the hotel was available. In this context, it is important to note that electricity use represents a large ongoing expense for any hotel. The major consumers of electricity are air conditioning, illumination, refrigeration, pumps and water heaters, if individual electric units are used.

Energy consumption

At the current state of construction there is no indication of:

- The type of air conditioning that will be used in the CTR (central air condition, individual mini-splits). However building design does not allow for natural ventilation and as a result the hotel will face increased air conditioning demand.
- Installations for illumination or any lighting fixtures, but a few bare fluorescent tubes to light the hallways of the west wing. It is important to note that the building design does not allow for natural light to illuminate hallways.
- The kind of equipment used to produce and supply the hotel with warm water. Options vary from individual electric water heaters (as seen in the region) to central water heating systems operated with gas or diesel or solar collectors to provide warm water.

6.3.4 Solid Waste Management

According to interviews with the project engineer, solid wastes would be managed in a new Villa Tunari sanitary landfill, if it is constructed. If the landfill is not constructed, solid wastes will be managed on site.

7. Environmental Findings and Recommendations

7.1 Location and Site

The CTR has been built within a distance of 50 m to 100 m of the current bed of San Mateo River. The municipal zoning and building code of Villa Tunari defines the area up to 100 m from the riverbank as risk zone. Within the risk zone there is no new construction allowed. Although the application of this regulation is hypothetical as the CTR property is not located within the municipality of Villa Tunari, the project is well aware of the risk posed by the San Mateo River. In this context a previous sales manager mentioned the necessity to construct gabions as identified in the study prepared by PROMIC. However, it is not clear who or which institution is actually responsible for building the required gabions. In the case of a restaurant/hotel in Villa Tunari the owner constructed gabions on her own initiative to protect her property.

Prior to construction the property had been cleared of its vegetation with the exception of a few palm trees. The area had been in agriculture previously. The area to the west of the access road

from the property entrance to the hotel is foreseen to accommodate the hotel's golf course. This area of denuded vegetation has grown back with grass.

The site inspection revealed two unregulated sources of rainwater runoff from the property to the San Mateo River causing erosion and in one case loss of property surface. When construction is continued, the project needs to consider proper management of rainwater runoff in order to avoid further erosion.

7.2 Construction

Rough construction (brick and block) of the CTR is basically completed. The conventional building design (concrete and block) did not use any of the local design styles or materials, nor does it allow for natural ventilation or make use of natural light. With the opportunities to reduce energy demand by cooling through natural ventilation and illumination through natural light being lost, the CTR will have to focus on the installation of energy efficient equipment and the efficient operation of any such equipment to reduce energy consumption.

7.3 Supporting infrastructure

Current installations are limited to some sanitary pipes and electrical conduit in the west wing and the rainwater drainage pipes from the roof and the balconies on east and west wing.

There were no visible installations that would have provided an understanding of the fresh water supply system, the energy supply system or the wastewater treatment system. Although with the drainage pipes installed in the west wing, it is assumed that there will be a holding tank ("septic tank") that serves at least as initial destination for wastewater channeled through the sanitary drain pipes.[15]

7.3.1 Fresh Water Supply

As stated in the NP it is recommended that the CTR undertake a study of the capacity and the hydrological condition of sub-watershed of the Capriles creek that will likely serve as source of fresh water for the hotel. Furthermore the NP mentions the need to redesign the system to capture and distribute the water.

Once these studies have been carried out, assuming that the Capriles creek has been approved by authorities as the hotel's water supply source, the CTR planners must decide how to treat the fresh water of the hotel.

The degree of treatment required to ensure that the fresh water supplied to hotel's installations does not pose a health risk to guest and staff depends on the water quality of the source. The water quality must be examined on a regular basis. Testing and laboratory analysis of water samples will establish the water quality of the Capriles creek as a baseline for developing a treatment system.

[15] The NP dated June 17, 2002 states that: 1) the system to capture and distribute freshwater had not been implemented and the design did not consider environmental implications; and 2) the systems for managing and disposing solid and liquid waste had not been defined yet.

Fresh water treatment can range from merely chlorinating to reduce the content of pathogens in the water[16] to a more elaborate treatment including sand and active carbon filters. Depending on the hardness of the water the CTR might have to consider installing a water softener.

To reach potable water quality, more sophisticated systems may be required. This could include systems such as a reverse osmosis plant or a filter system including an ultra violet filter for additional disinfection. Should the CTR opt to not process its fresh water to potable quality, it will need to inform its guests and staff accordingly and provide bottled water for hygienic use in guest bathrooms.

7.3.2 Wastewater Treatment

The discharge of untreated wastewater harms the environment. Water samples showing the presence of coliform bacteria indicate that the rivers of the Chapare, which also serve as a tourist attraction, are already contaminated with untreated sewage.
With no local or municipal sewerage network available at the location of the CTR, the hotel will need to treat the wastewater it generates. There are several options to treat wastewater, some of which are presented as follows:

Activated sludge plant
Principal component of an activated sludge plant is an equalization tank that receives and temporarily holds the effluent discharged from the hotel. This tank receives effluent before feeding it into the aeration reactor tank.

In the aeration tank, raw wastewater is supplied with oxygen (air) and mixed with bacteria. The bacteria break down the organic matter into CO_2 gas and new bacterial mass thereby "purifying" the wastewater. From the aeration tank the partially treated wastewater flows to the clarifier. In the clarifier the bacterial mass (activated sludge) separates from the affluent. The sludge settles to the bottom and is returned to the aeration tank. The treated wastewater, free of sediments, exits the clarifier through a weir and is disinfected (chlorinated and filtered) before being discharged to a tile field (subsurface) or a surface water body.

The advantages (+) and drawbacks (-) of this treatment option are:

(+) Well-operated activated sludge plants produce a high quality effluent that, if properly disinfected, can be readily used for irrigation.

(-) The capital investment needed to construct an activated sludge plant is moderate to high

(-) Many properties' on-site wastewater treatment plants are well designed and built, but are badly operated. They perform poorly and pose the risk of discharging semi-treated or insufficiently treated wastewater.

[16] Potable water supplied in the area of Villa Tunari is not treated or purified, but only chlorinated as in the case of the municipal water source.

Activated sludge plants are available as so-called package plants that include the entire plant in the form of one or two containers.

Oxidation ponds and constructed wetlands
Oxidation ponds are essentially earthen basins in which wastewater is treated by natural aerobic, anaerobic and a combination of both processes. A constructed wetland consists of a shallow body of water that supports the growth of plants, such as reed and cattails. The vegetation provides a surface for the attachment of bacteria films and aids in the filtration and absorption of pollutants.

The advantages (+) and drawbacks (-) of this treatment option are:

(+) If well designed, oxidation ponds are highly effective wastewater treatment systems.

(+) The systems have low construction cost and minimal operation and maintenance cost.

(-) Natural wastewater treatment processes are slow and require relatively large surface areas and long hydraulic retention times, which can range from 5 to 40 days. With the high level of precipitation in the area, the impact of 4-7 m of rainfall in the rainy season needs to be considered.

(-) Even well maintained oxidation ponds do create an odor from time to time. Therefore the hotel would have to select a location that ensures that any odor does not impact hotel operation.

Septic tanks and leaching fields
A septic tank is a watertight container that receives the sewage discharge of the hotel. It is generally composed of two chambers connected in series to separate the solids from the liquid waste, either by settling or by flotation. A septic tank provides a moderate reduction in the pollutant load contained in wastewater.

The septic tank should have a capacity that is equal or greater than the volume it is expected to receive over a 24-hour period to allow for adequate separation of the solids contained in the sewage.

A leachfield generally consists of a network of slotted pipes, laid in shallow trenches filled with gravel. The effluent from the septic tank is distributed over a large absorption surface and undergoes an additional biological oxidation process by passing over the biological film coating the gravel and the slotted pipes.

The advantages (+) and drawbacks (-) of this treatment option are:

(+) A septic tank and leach field require a relatively low capital investment and well designed systems have minimal operating cost.

(-) Since effective leachfields require large surface areas, from 7 to 18m^2 per guestroom, depending on the absorption characteristics of the soil, these systems are appropriate mainly for smaller properties (generally less than 50 rooms).[17]

(-) Septic tanks and leachfields seem to be simple systems. However, built by inexperienced contractors and without any engineering criteria, the systems generally perform poorly and pose the risk of discharging settled sewage into the groundwater.

Graywater collection and subsurface irrigation
Graywater consists of wastewater discharges that contain low to moderate levels of contaminants, such as water from the shower or bathtub, wash basin or the laundry. Graywater excludes discharges from urinals, toilets and kitchen sinks that are referred to as blackwater. With a minimum of treatment, mainly by being filtered and disinfected, graywater can be used for irrigation and in some cases is even used to refill toilet tanks. However, as graywater does contain pathogens, it must be handled with care and direct contact with guests or staff must be avoided.

The advantages (+) and drawbacks (-) of this treatment option are:

(+) Graywater separation can lower wastewater flows by more than 50 percent and thus greatly reduce the load on the hotel's wastewater treatment system.

(+) Graywater fertilizes the land at the same time it is purified in the biologically active topsoil on which it is applied.

(-) Graywater separation requires installation of two parallel wastewater collection systems: one for blackwater and the other for graywater. As it looks the CTR has installed separate piping for both wastewater types. Therefore it only needs to be assured that the two pipe systems feed into separate collection and treatment tanks.

7.3.3 Energy Supply

As stated there were no visible installations for the electricity supply to the hotel. The consultants assume that the CTR will connect to the local electricity grid as electrical power is readily available in the Chapare.[18] As mentioned earlier the CTR should consider installation of energy-efficient equipment when procuring the hotel's air conditioning system, water heating system, pumps, and so forth. As part of the selection process for equipment the CTR should consider the option to recover heat from the central a/c unit or central boiler (if central systems are chosen). In this context the CTR should investigate the possibility to use solar collectors to pre-heat the hotel's warm water.

[17] Applying the surface area requirement to the CTR, the leachfield would have to be 826 to 2,124 square meters in surface area size.
[18] There is a high tension power line passing just south of the CTR. ELFEC, the local energy provider, operates a substation located at Chimoré. According to ELFEC there is no problem with energy supply in the Chapare.

Solar water heaters
Solar water heating is a proven and readily available technology that uses the sun's energy to replace or supplement conventional water or pool heating systems. Solar water heaters are environmentally friendly, consuming no fossil fuels and producing no pollution.

They are used in Cochabamba and there are several companies that install systems. Although climate conditions between Cochabamba and the Tropics of Cochabamba vary considerably, in particular regarding the level of precipitation,[19] the majority of rainfall takes place throughout three months of the year and solar radiation might be sufficient to achieve satisfactory results with solar water heaters.

The CTR's electrical support infrastructure most probably will include the installation of a diesel generator to be used in the case of a power outage. It is recommended that the generator be properly sited and that generator and diesel tank be installed on concrete foundations with the necessary containing walls to avoid diesel spillage or contamination of the ground.

7.3.4 Solid Waste
There is no municipal solid waste collection that would service the CTR. Neither does the area have an adequate disposal site.[20] Therefore the CTR will have to manage the solid waste generated by the hotel's operation initially on site. The CTR can significantly facilitate the required waste management if it implements a waste management program that focuses on waste reduction measures, such as waste minimization, reuse, composting, recycling and separation of toxic or hazardous waste products. As this is an almost entirely operational task, more detailed explanations are presented in chapter 7.5.4.

With regard to the required installations, the CTR should allocate an area where the hotel's solid waste can be processed and stored. This area will have to contain a section with concrete flooring and a roof in order to store hazardous products and process and store recyclable products without any of these products being able to contaminate the surroundings or being affected by rain. In addition the solid waste area should include space to set up and manage a compost facility that allows the CTR to process all its biodegradable waste into compost. The compost can be used as organic fertilizer.[21]

7.4 Associated Activities
The CTR is planning to build sport installations including a golf course and tennis courts. The fairways and, in particular, the greens of the golf course will require intensive maintenance including the application of fertilizers, as well as herbicides and pesticides. Considering the very high precipitation in the area it is of extreme importance that the golf course be managed applying Best Practices in order keep applications of chemicals at a minimum and to avoid run off of pesticide, herbicides and fertilizers into the aquifer and the Río San Mateo below the golf course.

[19] Annual rainfall around Villa Tunari with 4,000 mm to 7,000 mm per year is several times higher than in Cochabamba.
[20] At the time of this review PRAEDAC, a European funded technical assistance agency, was implementing a project with the objective to build sanitary landfills in five municipalities in the Chapare.
[21] Studies have shown that up to 40 percent or 50 percent of solid waste generated in hotels is biodegradable. This percentage increases when the hotel is operated as all-inclusive resort as foreseen in the case of the CTR.

7.5 Operations

The CTR is not operational yet. Once construction of the property is finalized with the entire supporting infrastructure installed and the CTR becomes operational, hotel management should consider following Best Practices in its operations:

7.5.1 Fresh water management

The CTR should implement water conservation measures for all water consuming installations throughout the hotel. This includes the installation of water saving toilets, low flow showerheads, flow restrictors, faucet aerators, and self-closing shower valves in staff bathrooms. All installations need to be regularly maintained in order to ensure efficient operation.

Harvest and use rainwater

The area of the CTR receives around 6,000mm/m^2 per year of rain and the hotel should take advantage of this resource.

Properly harvested rainwater is clean and chemically pure and can thus be used in most hotel operations that do not require potable water.[22] The principal benefits of harvesting and using rainwater are presented below:

1. The use of rainwater instead of hard tap water in the laundry can significantly reduce the consumption of detergents and other laundry chemicals. For example, a 1 grain/gallon (17 mg/liter) reduction in the hardness of the wash water can reduce the consumption of some detergent by up to 1 oz/100 lb of linen.
2. The use of rainwater in the laundry can greatly reduce or eliminate the need to treat the wash water in a water softening column or with water softening chemicals.
3. Rainwater is naturally soft and does not deposit scale in water lines, plumbing fixtures and water heaters.
4. Rainwater harvesting reduces the amount of rainwater that is discharged to the ground or river during storms. This in turn reduces surface runoff, soil or river bank erosion, and the water logging problems that often affect the performance of soak-aways and tile fields during the rainy season.

Although the CTR has separate drainpipes for the rainwater collected on the roof and balconies, it is not clear where the rainwater will be discharged or routed. It appears as though the drainpipes discharge into an open register in front of the balconies on the ground floor and the water is allowed to partly soak away into the soils.

7.5.2 Wastewater Water Management

The CTR should adopt sound wastewater management practices and optimize the performance of the property's wastewater treatment and disposal system. The property should practice the following wastewater management practices regardless of the manner in which the hotel will treat and/or dispose of its wastewater flows.

[22] Rainwater is naturally soft and virtually free of iron and total dissolved solids (TDS).

- Use water efficiently to reduce the volume of wastewater sent to treatment/disposal system. Reducing the wastewater flow can greatly improve the performance of septic tanks, tile fields, soak-away pits, or a possible wastewater treatment plants.
- Use graywater and clean wastewater flows for irrigation in order to reduce the volume of wastewater sent to the treatment/disposal system.
- Avoid discharging problematic wastes into the drainage system, including sanitary napkins, cooking oil, grease and fat, lint, and wet-strength paper towels. These wastes clog drainage pipes and sewers, obstruct the outlet tees of septic tanks, reduce the holding capacity of the septic tanks, and can reduce the absorption capacity of tile fields and soak-away pits.
- Minimize the use of harsh and toxic chemicals on property to avoid harming the bacteria that purify the wastewater in septic tanks, tile fields and wastewater treatment plants. Harmful products include:
  - Brine and salt from a water softener
  - Bleach
  - Many toilet, sink and tub cleaners
  - Disinfectants
  - Drain cleaners
  - Strong acids and caustic
- Make sure that maintenance chemicals (e.g., motor oil, spent solvents, paint) are disposed of properly rather than dumped down the drain. Some maintenance chemicals can severely disrupt the operation of septic tanks, tile fields and wastewater treatment plants.
- Make sure that kitchen drains are equipped with well designed and well maintained grease traps. In order to ensure the proper performance of its grease traps, the property should:
  - Clean them regularly (by manually skimming the floating grease and solids, and removing the solids from the bottom of trap);
  - Not use chemicals, such as drain cleaners and acids, to dissolve the grease and solids that accumulate in the trap;
  - Not use hot water to dissolve and flush out the grease collected in the trap;
  - Minimize the discharge of solids and grease into the kitchen sinks; and
  - Make sure the grease traps are equipped with effective outlet tees.
- Minimize water surges into the wastewater collection system. For example, roof gutters should never be connected to the wastewater collection system because the high flows produced during storms can easily overload septic tanks, tile fields, soak-away pits and wastewater treatment plants.

In addition to implementing the wastewater management practices listed above, if the CTR will be operating its own wastewater treatment system, the plant operator should be well trained and regularly test the quality of the treated effluent. This training and quality control is particularly important if the treated wastewater is used for irrigation.

7.5.3. Energy Management

Excessive energy consumption also caused by inefficient use of energy results in increased operating cost, reduces profitability and needlessly increases the hotel’s impact on the environment.

With all electrical equipment still to be procured the CTR has the possibility to obtain the most energy and cost efficient solutions. However, energy conservation is not limited to the bigger installations such as air conditioning and water heating that have been mentioned earlier. Other energy conserving features include the installation of:

- Energy saving (fluorescent) light bulbs
- Occupancy sensors or key-cards to operate guest room a/c units.
- Photo sensors to operate exterior lighting
- Automatic controls that operate equipments such as pumps or a/c units
- Conveniently located and identifiable switches

The most energy efficient equipment might still unnecessarily consume energy if operated inappropriately. Providing staff with training and clients with information can encourage both to contribute to the energy conservations initiative of the hotel. For example staff can be instructed to:

- Ensure that all lights, the TV and the a/c unit are turned off when cleaning and after leaving the room;
- Set the a/c unit to a defined temperature if the guest wishes his or her room to be cooled continuously;
- Close curtains to reduce exposure to direct sunlight that will heat the room;
- Review rooms immediately after check out, and switch off all lights and equipment.

7.5.4 Solid Waste Management

The composition of solid waste generated in hotels is classified as domestic and consists mainly of food, glass, plastic, metal, paper and organic waste. In order to reduce the amount of waste that is generated once the CTR is in operation and minimize the environmental impact, the hotel should consider the following measures:

Reduction

As a first step to reduce the amount of waste generated in its operation, the hotel should review its purchasing decisions. Taking into account environmental aspects when purchasing can be achieved by giving preference to:

- Environmentally friendly products and chemicals
- Products sold in bulk or concentrate (to reduce packaging)
- Products sold in refillable containers or reusable packaging
- Products that are supplied with a minimum amount of packaging
- Products that are made from or contain recycled materials
- Products that are reusable and durable (instead of disposable items)
- Products manufactured locally

Reuse

Whenever possible the hotel should reuse items in their original form for the same or a different purpose rather than disposing them. Examples of standard reuse measures for hotels include:

- Only serve beverages that are packaged in refillable bottles or kegs that can be returned to the supplier.
- Use the back side of computer and office paper to print draft documents or internal memos.
- Give preference to vendors that supply their products in returnable or refillable containers.
- Replace the plastic liners that are used in guestroom garbage bins only when they are soiled or unsuitable for further use.

Recycling and composting
Although there does not exist a formal recycling infrastructure in the Tropics of Cochabamba, the CTR could consider contacting recycling services in Cochabamba to investigate requirements for companies to accept recyclable products from Villa Tunari and the region.[23]

Garden waste should be kept separate and used in the hotel's compost site. The compost produced from an actively managed decomposing process will enrich (fertilize) the soil of the hotel's gardens. Once the compost site for grass clippings and leaves is operational, the CTR could introduce organic waste from its kitchen, such as fruit and vegetable leftovers.

Toxic or hazardous products
It is most important that the CTR separate hazardous waste products and deliver them to adequate disposal systems or sites.[24]

Hazardous waste includes:

- Oil filters of vehicle or any other motor driven equipment
- Mineral oil (motor oil) and vegetable oil (from kitchen operations)
- Rugs soaked with oil
- Batteries
- Fluorescent lamps
- Car batteries
- Electromagnetic or electronic ballasts of fluorescent light tubes
- Spray paint or insecticide cans

Most of these waste items do not take up to much volume, but they have great potential for contaminating the environment or subsurface when buried. Therefore the CTR should consider separating these items, storing them in appropriate containers and transporting them to Cochabamba where the city operates an adequate sanitary landfill.

[23] The currently planned landfill site could serve as collection and storage center for recyclables in order to reach economically viable volumes for a recycler.
[24] For example, Cochabamba has a project that offers its citizens to dispose of old batteries in containers located in central locations such as supermarkets or office buildings.

7.6 Implementing an Environmental Management System

Environmental management is a systematic approach to finding practical ways to improve the operating efficiency of hotels without compromising the quality of guest service. Given that hotels use large amounts of water, energy, chemicals and materials, even small efficiency gains can lead to large cost savings. In addition, conservation and waste reduction help protect the Chapare's natural beauty and ensure the long-term sustainability of tourism in the Tropics of Cochabamba.

The owners and operators of the CTR should consider implementing an Environmental Management System (EMS) to optimize operating efficiency and reduce the environmental impact caused by the hotel's operation. An EMS is a tool that helps organizations improve their environmental performance by integrating environmentally beneficial actions into their activities, products and services. Hence, an EMS is a system for coordinating, managing and improving existing processes to help a company to achieve its environmental objectives.

Adopting environmental Best Practices and supporting their implementation through an EMS can help a property stand out from the competition and be recognized through certification programs, awards, tour operator programs, and other special promotions. Getting recognized for a commitment to environmental management can enhance a property's image with environmentally conscious guests and tour operators.

7.7 Certification

There are various certification schemes for environmental conscious operating hotels. The most widely known are EMAS, ISO 14001 and Green Globe. However, EMAS is only certifiable in Europe and ISO 14001, although certifiable worldwide, is applicable to any kind of industry. As a result more and more tourism-oriented companies opt for the certification of Green Globe 21 (GG21). Green Globe 21 is a program and standard that focuses on the tourism industry and helps participating businesses to develop a more sustainable approach to operate and at the same time contribute to the development of a more sustainable tourism.

8. LAC Checklist

The USAID LAC environmental checklist was consulted as required during the conduct of this assessment. The following is a reprint of the checklist as contained in Appendix C of the LAC environmental Guidelines.

Appendix C – LAC Guidelines

The purposes of this *Environmental Assessment Checklist (EA Checklist)* are to determine whether the proposed action (scope of work) encompasses the potential for environmental pollution or damage and, if so, to determine the scope and extent of additional environmental evaluation, mitigation, and monitoring necessary to fulfill federal U.S. environmental requirements. The *EA Checklist* is intended to be used in conjunction with a brief Project Description prepared by the Project Engineer.

Environmental Consequences: Check appropriate column as Yes (Y), Maybe (M), No (N) or Beneficial (B). Briefly explain Y, M and B checks in next Section, "Explanations." A "Y" response does not necessarily indicate a significant effect, but rather an issue that requires focused consideration.

Y, M, N or B

1. Earth Resources

a. grading, trenching, or excavation > 1.0 hectare ___

b. geologic hazards (faults, landslides, liquefaction, unengineered fill, etc.) ___

c. contaminated soils or ground water on the site ___

d. offsite overburden/waste disposal or borrow pits required > 1.0 ton ___

e. loss of high-quality farmlands > 10 hectares ___

2. Air Quality

a. substantial increase in onsite air pollutant emissions (construction/operation) ___

b. violation of air pollutant emissions or ambient concentration standards ___

c. substantial increase in vehicle traffic during construction or operation ___

d. demolition or blasting for construction ___

e. substantial increase in odor during construction or operation ___

f. substantial alteration of microclimate ___

3. Water Resources and Quality

a. river, stream or lake onsite or within 30 m of construction ___

b. withdrawals from or discharges to surface or ground water ___

c. excavation or placing of fill, removing gravel from, a river, stream or lake ___

d. onsite storage of liquid fuels or hazardous materials in bulk quantities ___

4. Cultural Resources

a. prehistoric, historic, or paleontological resources within 30 m of construction ___

b. site/facility with unique cultural or ethnic values ___

5. Biological Resources

a. vegetation removal or construction in wetlands or riparian areas > 1.0 hectare ___

b. use of pesticides/rodenticides, insecticides, or herbicides > 1.0 hectare ___

c. construction in or adjacent to a designated wildlife refuge ___

6. Planning and Land Use

a. potential conflict with adjacent land uses ___

b. non-compliance with existing codes, plans, permits or design factors ___

c. construction in national park or designated recreational area ___

d. create substantially annoying source of light or glare ___

e. relocation of >10 individuals for +6 months ___

f. interrupt necessary utility or municipal service > 10 individuals for +6 months ___

g. substantial loss of inefficient use of mineral or non-renewable resources ___

h. increase existing noise levels >5 decibels for +3 months ___

7. Traffic, Transportation and Circulation

a. increase vehicle trips >20 percent or cause substantial congestion ___

b. design features cause or contribute to safety hazards ___

c. inadequate access or emergency access for anticipated volume of people or traffic ___

8. Hazards

a. substantially increase risk of fire, explosion, or hazardous chemical release ___

b. bulk quantities of hazardous materials or fuels stored on site +3 months ___

c. create or substantially contribute to human health hazard ___

EXPLANATION: Explain Y, M and B responses

Recommended Mitigation Measures

Recommended Action (Check Appropriate Action):

(a) The project has no potential for substantial adverse environmental effects. No further environmental review is required.
(b) The project has little potential for substantial adverse environmental effects, however the recommended mitigation measures (listed above) will be incorporated in the SOW. No further environmental review is required.
(c) The project has substantial but mitigable adverse environmental effects and required measures to mitigate environmental effects (listed above) will be included in the SOW.
(d) The project has potentially substantial adverse environmental effects, but requires more analysis to form a conclusion. An Environmental Assessment will be prepared.
(e) The project has potentially substantial adverse environmental effects, and revisions to the project design or location or the development of new alternatives is required.
(f) The project has substantial and unmitigable adverse environmental effects. Mitigation is insufficient to eliminate these effects and alternatives are not feasible. The project is not recommended for funding.

Approval
Project Director _____ Date _____